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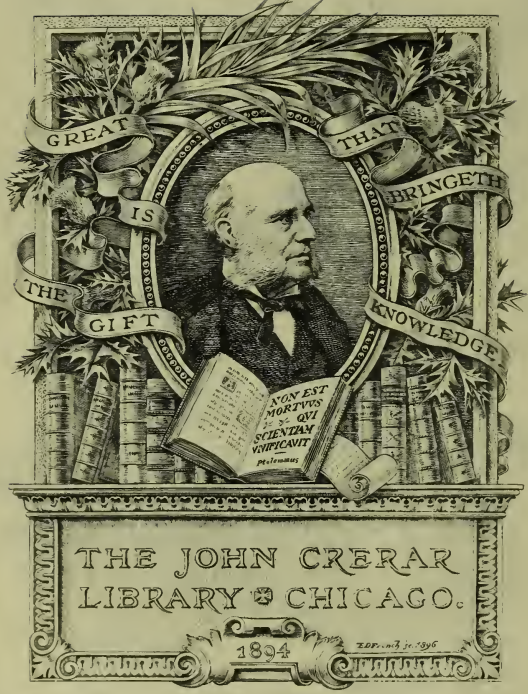

PRESENTED BY
Ohio University.

University Bulletin, Series IV, No. 19.

OHIO STATE UNIVERSITY

LAKE LABORATORY

LOCATED AT

SANDUSKY ON LAKE ERIE.

ANNOUNCEMENT

FOR THE

SUMMER OF 1900.

Entered at the Post-Office at Columbus, Ohio,
as Second Class Matter.

ANNOUNCEMENT.

The Lake Laboratory of the Ohio State University was established under the direction of the late Prof. D. S. Kellicott, for the especial purpose of providing opportunity for investigation of the biology of the lake region, and investigations have been carried on each summer since its establishment except for the summer of 1898, when the death of Prof. Kellicott interrupted the work. It has now been determined to add to the original purpose the provision for giving certain courses of instruction and to combine work of the departments of botany and zoology. The following statements concerning the plans for the summer of 1900 are made for the benefit of those who may wish to work at the laboratory, either in independent investigations or in connection with the courses of instruction offered.

STAFF.

The staff includes the regular instructors in the departments of Botany, Zoology and Entomology.

HERBERT OSBORN, Prof. of Zoology and Entomolgy, *Director.*

W. A. KELLERMAN, Prof. of Botany.

JAMES S. HINE, Ass't Prof. of Entomology.

J. H. SCHAFFNER, Ass't Prof. of Botany.

F. L. LANDACRE, Ass't in Zoology.

Other lecturers or special assistants will be provided as needed or as the number of students and means at disposal may permit.

LOCATION.

The laboratory is conveniently located close to the waters of Sandusky Bay, which teem with animal and plant life, while extensive marshes, the river, native forest, beach and lake are all within easy reach and furnish unusual opportunities for study of life under varied conditions. Put-in-Bay with the U. S. Fish Hatchery, Kelley's Island with its famous glacial grooves, and other points of great natural interest are easily reached by excursions and will be visited in collecting or special trips. The extensive fishing industry centering at Sandusky, affords special opportunity for study and investigation in ichthyology.

EQUIPMENT.

The laboratory is housed in the former State Hatchery building which has been arranged with tables, dark room, aquaria, etc., and is supplied with microscopes and other apparatus from the university. Boats, collecting apparatus, dredges, seines, etc., are well supplied and special attention will be given to the methods of collecting and field work.

COURSES OF STUDY.

ZOOLOGY AND ENTOMOLOGY.

(*a*) Laboratory and field course including dissection or microscopic study of type forms, aquaria and field studies with instruction in collecting and preparing material for laboratory use and permanent collections. Special attention will be given to fishes and food of fishes.

(*b*) Advanced course in Invertebrate Morphology or Embryology.

(*c*) Field and laboratory course in Entomology.

(*d*) Special course in Ichthyology devoted particularly to the lake fishes, their habits and food supplies.

BOTANY.

(*a*) Laboratory and field course including a study of type forms. The course will consist of collecting trips in the field where common species of each class are found, classification of the familiar forms, study of structure and special parts of interest in connection with each group, with methods of preserving for immediate use and permanent preservation.

(*b*) General botany consisting largely of Ecology and Morphology.

(*c*) Laboratory course; the work to be arranged.

METHODS OF INSTRUCTION.

Work will consist very largely of field collecting and observations, study of relation to environment supplemented by laboratory dissections and microscopic examinations. The general courses are especially intended for the benefit of teachers who may wish to familiarize themselves with methods of field work and the manipulation of laboratory material. The advanced courses will enable university students to pursue special lines with better opportunities for outdoor work than can well be provided at other seasons; and for these they may secure university credits on equivalent courses.

LABORATORY FEES AND OTHER EXPENSE.

For the coming summer the laboratory fee has been fixed at $20.00 for a term of eight weeks with a proportionate reduction for less time, but no enrollment will be made for less than a half term. Each course is expected to occupy half of the time available, therefore, each student will on payment of one fee be entitled to any two of the courses outlined above.

Good accommodations convenient to the laboratory are to be had at reasonable rates. The past summer these were $3.50 to $4.00 per week.

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DATE OF OPENING.

The courses of instruction will open July 2d, and run eight weeks, an arrangement which will doubtless accommodate those teachers who may wish to attend the State Teachers Association at Put-in-Bay.

It will be most satisfactory to enter at the beginning of the course, but from the nature of the work it will be possible for a student to enter at any time and profit by the work in progress. Five days each week will be devoted to regular exercises and one day left open for individual or special excursions.

Applications should be made as early as possible, not later than June 10th, even if it is impossible to begin with the opening day. It will be necessary to provide assistance, apparatus and supplies according to number in attendance, and the fees have been placed so low that proper provision is dependent on knowing the number in advance.

OPPORTUNITIES FOR INVESTIGATION.

Following the plan which has been in operation for several years past, the laboratory will be open to properly qualified persons who may desire to engage in investigations of biological problems pertaining to the life of the locality. No fees will be charged and table room, use of ordinary reagents, boats, aquaria, etc., will be supplied subject only to such provisions as may be necessary to make the facilities equally available to all. Each investigator will be expected to furnish his own microscope, cutting instruments, and special apparatus or reagents needed in his investigation unless otherwise arranged.

The laboratory will be open for investigators from June 15th to September 15th. Applications for table room should be made as early as possible with indication of the time during which space will be desired.

Special inquiries regarding Zoology should be addressed to Prof. Herbert Osborn.

Special inquiries regarding work in Botany should be addressed to Prof. W. A. Kellerman.

Applications and correspondence relating to the laboratory in general should be addressed to the Director,

Prof. Herbert Osborn,
Ohio State University,
Columbus.

Address, June 15th to Sept. 1st,
Lake Laboratory, Sandusky, O.

University Bulletin. *Series V, No. 6.*

OHIO STATE UNIVERSITY

LAKE LABORATORY

LOCATED AT

SANDUSKY ON LAKE ERIE.

ANNOUNCEMENT

FOR THE

SUMMER OF 1901.

Entered at the Post-Office at Columbus, Ohio,
as Second Class Matter.

Announcement.

The Lake Laboratory of the Ohio State University was established under the direction of the late Prof. D. S. Kellicott, for the especial purpose of providing opportunity for investigation of the biology of the lake region, and investigations have been carried on each summer since its establishment except for the summer of 1898, when the death of Prof. Kellicott interrupted the work. In 1900 it was determined to add to the original purpose provision for giving certain courses of instruction and to combine work of the departments of botany and zoology. The following statements concerning the plans for the summer of 1901 are made for the benefit of those who may wish to work at the laboratory, either in independent investigations or in connection with the courses of instruction offered.

STAFF.

The staff includes the regular instructors in the departments of Botany, Zoology and Entomology.

HERBERT OSBORN, Prof. of Zoology and Entomology, *Director.*

W. A. KELLERMAN, Prof. of Botany.
JAMES S. HINE, Ass't Prof. of Entomology.
J. H. SCHAFFNER, Ass't Prof. of Botany.
F. L. LANDACRE, Ass't Prof. of Zoology.
HARRIET G. BURR, Ass't in Botany.

Other lecturers or special assistants will be provided as opportunity offers.

LOCATION.

The laboratory is conveniently located close to the waters of Sandusky Bay, which teem with animal and plant life, while extensive marshes, the river, native forest, beach and lake are all within easy reach and furnish unusual opportunities for study of life under varied conditions. Put-in-Bay with the U. S. Fish Hatchery, Kelley's Island with its famous glacial grooves, and other points of great natural interest are easily reached by excursions and will be visited in collecting or special trips. The extensive fishing industry centering at Sandusky, affords special opportunity for study and investigation in ichthyology.

EQUIPMENT.

The laboratory is housed in the former State Hatchery building which has been arranged with tables, dark room, aquaria, etc., and is supplied with microscopes and other apparatus from the university. Boats, collecting apparatus, dredges, seines, etc., are well supplied and special attention will be given to the methods of collecting and field work.

INTERIOR INVESTIGATOR'S LABORATORY.

COURSES OF STUDY.

ZOOLOGY AND ENTOMOLOGY.

(*a*) Laboratory and field course including dissection or microscopic study of type forms, aquaria and field studies with instruction in collecting and preparing material for laboratory use and permanent collections. Special attention will be given to fishes and food of fishes.

(*b*) Advanced course in Invertebrate Morphology or Embryology.

(*c*) Field and laboratory course in Entomology.

(*d*) Special course in Ichthyology devoted particularly to the lake fishes, their habits and food supplies.

BOTANY.

(*a*) Laboratory and field course including a study of type forms. The course will consist of collecting trips in the field where common species of each class are found, classification of the familiar forms, study of structure and special parts of interest in connection with each group, with methods of preserving for immediate use and permanent preservation.

(*b*) General botany consisting largely of Ecology and Morphology.

(*c*) Laboratory course ; the work to be arranged.

METHODS OF INSTRUCTION.

Work will consist very largely of field collecting and observations, study of relation to environment supplemented by laboratory dissections and microscopic examinations. The general courses are especially intended for the benefit of teachers who may wish to familiarize themselves with methods of field work and the manipulation of laboratory material. The advanced courses will enable university students to pursue special lines with better opportunities for outdoor work than can well be provided at other seasons ; and for these they may secure university credits on equivalent courses.

LABORATORY FEES AND OTHER EXPENSE.

For the coming summer the laboratory fee has been fixed at $20.00 for a term of eight weeks with a proportionate reduction for less time, but no enrollment will be made for less than a half term. Each course is expected to occupy half of the time available, therefore, each student will on payment of one fee be entitled to any two of the courses outlined above.

Good accomodations convenient to the laboratory are to be had at reasonable rates. The past summer these were $3.50 to $4.00 per week. Board in clubs may be had at $1.85 to $2.00, while some students by camping have been able to still further reduce expenses.

Collecting Party.

DATE OF OPENING.

The courses of instruction will open July 1st, and run six and eight weeks.

It will be most satisfactory to enter at the beginning of the course, but from the nature of the work it will be possible for a student to enter at any time and profit by the work in progress. Five days each week will be devoted to regular exercises and one day left open for individual or special excursions.

Applications should be made as early as possible, not later than June 10th, even if it is impossible to begin with the opening day. It will be necessary to provide assistance, apparatus and supplies according to number in attendance, and the fees have been placed so low that proper provision is dependent on knowing the number in advance.

OPPORTUNITIES FOR INVESTIGATION.

Following the plan which has been in operation for several years past, the laboratory will be open to properly qualified persons who may desire to engage in investigations of biological problems pertaining to the life of the locality. No fees will be charged and table room, use of ordinary reagents, boats, aquaria, etc., will be supplied subject only to such provisions as may be necessary to make the facilities equally available to all. Each investigator will be expected to furnish his own microscope, cutting instruments, and special apparatus or reagents needed in his investigation unless otherwise arranged.

The laboratory will be open for investigators from June 15th to September 15th. Applications for table room should be made as early as possible, with indication of the time during which space will be desired.

Special inquiries regarding Zoology should be addressed to Prof. Herbert Osborn.

Special inquiries regarding work in Botany should be addressed to Prof. W. A. Kellerman.

Applications and correspondence relating to the laboratory in general should be addressed to the Director,

Prof. Herbert Osborn,
Ohio State University,
Columbus.

Address, June 15th to Sept. 1st,
Lake Laboratory, Sandusky, O.

Interior Student's Laboratory.

THE
JOHN CRERAR
LIBRARY

University Bulletin. *Series VI, No. 5.*

Ohio State University

LAKE LABORATORY

LOCATED AT

SANDUSKY ON LAKE ERIE.

ANNOUNCEMENT

FOR THE

SUMMER OF 1902.

Entered at the Post-Office at Columbus, Ohio,
as Second Class Matter.

Announcement.

THE Lake Laboratory of the Ohio State University is designed to provide opportunity for investigation of the biology of the lake region, and for giving certain courses of instruction in the departments of botany, zoology and entomology. The following statements concerning the plans for the summer of 1902 are made for the benefit of those who may wish to work at the laboratory, either in independent investigations or in connection with the courses of instruction offered.

Staff.

The staff includes the regular instructors in the departments of Botany, Zoology and Entomology.

HERBERT OSBORN, Prof. of Zoology and Entomology, Director.
W. A. KELLERMAN, Prof. of Botany.
JAMES S. HINE, Ass't Prof. of Entomology.
J. H. SCHAFFNER, Ass't Prof. of Botany.
F. L. LANDACRE, Ass't Prof. of Zoology.

Other lecturers or special assistants will be provided as opportunity offers.

Location.

The laboratory is conveniently located close to the waters of Sandusky Bay, which teem with animal and plant life, while extensive marshes, the river, native forest, beach and lake are all within easy reach and furnish unusual opportunities for study of life under varied conditions. Put-in-Bay with the U. S. Fish Hatchery, Kelley's Island with its famous glacial grooves, and other points of great natural interest are easily reached by excursions and are visited in collecting or special trips. The extensive fishing industry centering at Sandusky, affords special opportunity for study and investigation in ichthyology.

Equipment.

The laboratory is housed in the former State Hatchery building which has been arranged with tables, dark room, aquaria, etc., and is supplied with microscopes and other apparatus from the University. Boats, collecting apparatus, dredges, seines, etc., are well supplied and special attention will be given to the methods of collecting and field work.

Courses of Study.

ZOOLOGY AND ENTOMOLOGY.

(*a*) *General Zoology.* Laboratory and field course with occasional lectures and quiz, and including dissection or microscopic study of type forms, aquaria and field studies with instruction in collecting and preparing material for laboratory use and permanent collections. Special attention will be given to fishes and food of fishes.

(*b*) *Advanced Courses.* Invertebrate Morphology and Comparative Anatomy of Vertebrates. Equivalent to similar courses in the University, and credits of one term may be secured.

(*c*) *Entomology.* Field and laboratory course, including instruction in collecting, mounting and identifying insects in connection with studies on life history and anatomy.

(*d*) *Ichthyology.* Special course devoted particularly to the lake fishes, their habits and food supplies.

(*e*) *Ornithology.* Special course in systematic and ecological study of birds of the region.

BOTANY.

(*a*) *General Botany.* Laboratory and field course, including the study of type forms, from the lowest to the highest orders. The course will consist of collecting trips in the field where common species of each class are found, classification of the familiar forms and the study of the structure of interest in connection with the evolution and relationship of each group; also methods of preparation and preservation for future use.

(*b*) *Ecology.* General course including a study of local ecological problems and local plant geography.

(*c*) *Special Work in Ecology.* Investigation of some special ecological adaption or of some geographical area; the work to be arranged.

(*d*) *Morphology* and *Taxonomy* of the *Algae.* Field and laboratory work.

Advanced Courses and University Credits.

It will be noticed that several of the advanced courses cover ground of the university courses and students with university standing may secure university credits for work which is equivalent to such university courses. The opportunities for research or thesis work are also exceptionally good in certain lines.

Methods of Instruction.

Work will consist very largely of field collecting and observations, study of relation to environments supplemented by laboratory dissections and microscopic examinations. The general courses are especially intended for the benefit of teachers who may wish to familiarize themselves with methods of field work and the manipulation of laboratory material.

Party at Boat Landing.

Laboratory Fees and Other Expenses.

For the coming summer the laboratory fee has been fixed at $20.00 for a term of six weeks' instruction with privilege of continuing laboratory work at least two weeks after lecture courses are completed. No enrollment will be made for less than a half term. Each course is expected to occupy half of the time available, therefore, each student will, on payment of one fee, be entitled to any two of the courses outlined above.

Interior of Students' Laboratory.

Accommodations for Room and Board.

Good accommodations convenient to the laboratory are to be had at reasonable rates. The past summer these were $3.50 to $4.00 per week. Board in clubs may be had at $1.85 to $2.00, while some students by camping have been able to still further reduce expenses.

Excursions and Collecting Trips.

From the nature of the locality a great number of delightful excursions are possible and many rich collecting grounds are visited on these excursions. During the last session special excursions were made on Saturdays to Black Channel; Lakeside; Castalia, where the remarkable blue spring is located; to Kelley's Island, to examine the Glacial Grooves; to Put-in-Bay, where an excellent opportunity was afforded to see the work of the Fish Commission party in Plankton investigation; and to Green Island, which is uninhabited except for the Light House Station, and affords excellent opportunities for collecting.

North Shore of Green Island.

General Lectures.

Occasional Lectures of a general character are given by members of the station staff, and others from outside parties will be secured as occasion permits. During the last session the following subjects were presented: Adaptation in Animal Life," "Aquatic Life in Air-breathing Animals," "Protective Resemblance and Mimicry," "Some Phases of Evolution," "Some Problems and Results in Applied Zoology," by the Director, and one on "Natural Selection," by Prof. Landacre.

Recreation.

While the surroundings afford a great inducement to steady work and thorough study, there is abundant attraction in the waters of the bay for relaxation in sailing and rowing, and in the tempting beach and surf of Cedar point for bathing and swimming. It is possible, therefore, to carry a pretty full course of study and still keep in full vigor and feel rejuvenated at the end of the course.

Date of Opening.

The courses of instruction will open July 7th, and run six weeks, use of laboratory being open longer to students desiring to continue work.

It will be most satisfactory to enter at the beginning of the course, but from the nature of the work it will be possible for a student to enter at any time and profit by the work in progress. Five days each week will be devoted to regular exercises and one day left open for individual or special excursions.

It is desired that applications be made as early as possible, with statement of kind of work desired, even if it is impossible to begin with the opening day. It will be necessary to provide assistance, apparatus and supplies according to number in attendance, and the fees have been placed so low that proper provision is dependent on knowing the number in advance.

Opportunities for Investigation.

Following the plan which has been in operation for several years past, the laboratory will be open to properly qualified persons who may desire to engage in investigations of biological problems pertaining to the life of the locality. No fees will be charged, and table room, use of ordinary reagents, boats, aquaria, etc., will be supplied subject only to such provisions as may be necessary to make the facilities equally available to all. Each investigator will be expected to furnish his own microscope, cutting instruments, and special apparatus or reagents needed in his investigation unless otherwise arranged.

The laboratory will be open for investigators from June 15th to September 15th. Applications for table room should be made as early as possible, with indication of the time during which space will be desired.

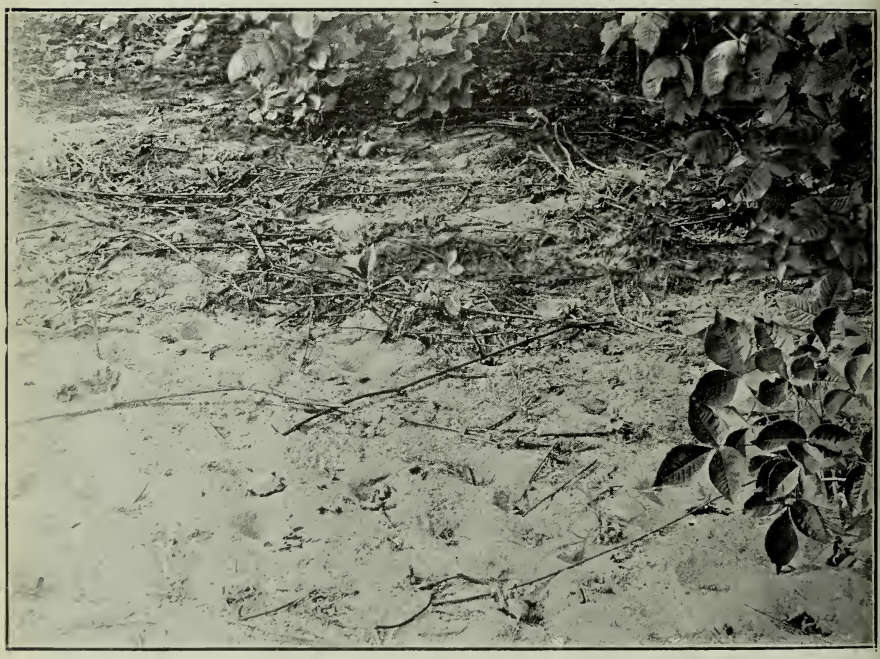
Special inquiries regarding Zoology should be addressed to Prof. Herbert Osborn.

Special inquiries regarding work in Botany should be addressed to Prof. W. A. Kellerman.

Applications and correspondence relating to the laboratory in general should be addressed to the Director,

Prof. Herbert Osborn,
Ohio State University, Columbus.

Address, June 20th to Sept. 1st, Lake Laboratory, Sandusky, O.



Ant Lion Work in Sand, Cedar Point.

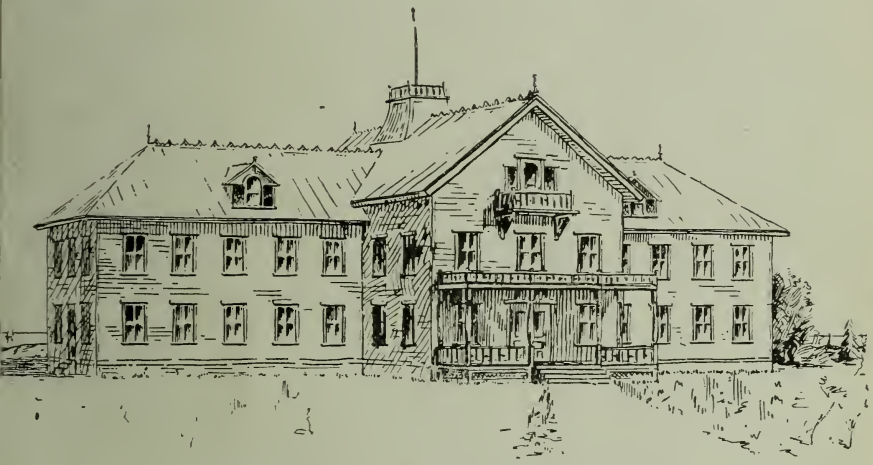
University Bulletin *Series VII, No. 10*

Ohio State University

LAKE LABORATORY

LOCATED AT

SANDUSKY ON LAKE ERIE



PERSPECTIVE OF NEW LABORATORY BUILDING

ANNOUNCEMENT

FOR THE

SUMMER OF 1903

Entered at the Post-Office, Columbus, Ohio,
as Second Class Matter

ANNOUNCEMENT

The Lake Laboratory of the Ohio State University is designed to provide opportunity for investigation of the biology of the lake region, and for giving certain courses of instruction in the departments of Botany, Zoology and Entomology. The following statements concerning the plans for the summer of 1903 are made for the benefit of those who wish to work at the laboratory, either in independent investigations or in connection with the courses of instruction offered.

STAFF

The staff includes the regular instructors in the departments of Botany, Zoology and Entomology.

Herbert Osborn, Prof. of Zoology and Entomology, Director.
W. A. Kellerman, Prof. of Botany.
James S. Hine, Associate Prof. of Entomology.
J. H. Schaffner, Associate Prof. of Botany.
F. L. Landacre, Associate Prof. of Zoology.
Otto E. Jennings, Assistant in Botany.

Other lecturers or special assistants will be provided as opportunity offers, or number of students may demand.

LOCATION

The laboratory is conveniently located close to the waters of Lake Erie and Sandusky Bay, which teem with animal and plant life, while extensive marshes, the river, native forest, sandy beach and rocky islands are all within easy reach and furnish opportunities for study of life under varied conditions. Put-in-Bay with the U. S. Fish Hatchery, Kelly's Island with its famous glacial grooves, and other points of great natural interest are easily reached by excursions and are visited in collecting or special trips. The extensive fishing industry centering at Sandusky, affords special opportunity for study and investigation in Ichthyology.

EQUIPMENT

Provision has been made for a new and commodious laboratory building capable of accommodating at least one hundred students and investigators, the construction of which will proceed as rapidly as possible and it is expected to be fully ready for use at opening of this session.

It will be fully provided with tables, dark rooms, aquaria, etc., and supplied with microscopes and other apparatus from the University.

Boats, collecting apparatus, dredges, seines, etc., are well supplied and special attention will be given to the methods of collecting and field work.

COURSES OF STUDY

ZOOLOGY AND ENTOMOLOGY.

(*a*) *General Zoology.* Laboratory and field course with occasional lectures and quiz, and including dissection or microscopic study of type forms, aquaria and field studies with instruction in collecting and preparing material for laboratory use and permanent collections. Special attention will be given to fishes and food of fishes. Associate, Professor Landacre.

(*b*) *Advanced Courses.* Invertebrate Morphology and Comparative Anatomy of Vertebrates. Equivalent to similar courses in the University, and credits of one term may be secured. Prof. Osborn; Associate, Prof. Landacre.

(*c*) *Entomology.* Field and laboratory course, including instruction in collecting, mounting and identifying insects in connection with studies on life history and anatomy. Prof. Osborn; Associate, Prof. Hine.

(*d*) *Ichthyology.* Special course devoted particularly to the lake fishes, their habits and food supplies. Prof. Osborn; Associate, Prof. Landacre.

(*e*) *Ornithology.* Special course in systematic and ecological study of birds of the region. Associate, Prof. Hine.

BOTANY.

(*a*) *General Botany.* Laboratory and field course, including the study of type forms, from the lowest to the highest orders. The course will consist of collecting trips in the field where common species of each class are found, classification of the familiar forms and the study of the structure of interest in connection with the evolution and relationship of each group; also methods of preparation and preservation for future use. Prof. Kellerman.

(*b*) *Ecology.* General course (following Coulter's Plant Relations), and a study of local problems and local plant geography. Prof. Kellerman.

(*c*) *Special Work.* Subject selected may be in Ecology; or some plant or small group in Systematic Botany. Prof. Kellerman, Mr. Jennings.

(*d*) *Morphology and Taxonomy of Algae.* Field and laboratory work with occasional lectures. Prof. Kellerman.

(*e*) *Morphology and Taxonomy of Fungi.* Field and laboratory work with occasional lectures. Prof. Kellerman.

For courses *c*, *d* and *e* University credits may be secured.

PHYSIOLOGY.

A course in Physiology will be offered by Prof. A. M. Bleile, provided a sufficient number apply for such work to warrant its introduction.

ADVANCED COURSES AND UNIVERSITY CREDITS

It will be noticed that several of the advanced courses cover ground of the university courses and students with university standing may secure university credits for work which is equivalent to such university courses. The opportunities for research or thesis work are also exceptionally good in certain lines.

METHODS OF INSTRUCTION

Work will consist very largely of field collecting and observations, study of relation to environments supplemented by laboratory dissections and microscopic examinations. The general courses are especially intended for the benefit of teachers who may wish to familiarize themselves with methods of field work and the manipulation of laboratory material.

LABORATORY FEES AND OTHER EXPENSES

For the coming summer the laboratory fee has been fixed at $20.00 for a term of six weeks' instruction with privilege of continuing laboratory work at least two weeks after lecture courses are completed. No enrollment will be made for less than a half term. Each course is expected to occupy half of the time available, therefore, each student will, on payment of one fee, be entitled to any two of the courses outlined above.

ACCOMMODATIONS FOR ROOM AND BOARD

Rooms in the laboratory may be occupied and will be assigned in order of application to acceptable persons. Room and board in Sandusky ranges from $3.50 to $4.50 per week. Those who desire to camp will find this an economical way to spend the summer. An early application with statement of kind of living desired will aid in securing satisfactory accommodations. Should a sufficient number wish to secure board together to warrant forming a club the cost of board will be reduced to actual cost of provisions and service.

EXCURSIONS AND COLLECTING TRIPS

From the nature of the locality a great number of delightful excursions are possible and many rich collecting grounds are visited on these excursions.

During the last session special excursions were made on Saturdays to Black Channel, Lakeside, Castalia, where the remarkable blue spring is located; to Kelly's Island, to examine the glacial grooves; to Hen and Chicken Island, where an opportunity was afforded to study the nesting habits of the terns; to Johnson Island; to Green Island, which is uninhabited except for the Light House Station, and affords excellent opportunities for collecting, and to the upper bay and gypsum beds near Gypsum.

NORTH SHORE OF GREEN ISLAND

GENERAL LECTURES

Occasional lectures of a general character are given by members of the station staff, and others from outside parties will be secured as occasion permits. During the last session the following subjects were presented: "Physiographic Features of Sandusky Region," by Prof. E. L. Moseley; "The Harriman

Alaskan Expedition," by Mr. Leon J. Cole, of the U. S. Fish Commission; "The Biological Features of the Florida Keys," by Prof. E. L. Morris, of the U. S. Department of Agriculture; "Adaptation in Animal Life," by the Director; "Evolution of Plants in Time," by Prof. J. H. Schaffner; "Collecting in the Philippine Islands," by Prof. E. L. Mosely.

RECREATION

While the surroundings afford a great inducement to steady work and thorough study, there is abundant attraction in the waters of the bay for relaxation in sailing and rowing, and in the tempting beach and surf of Cedar Point for bathing and swimming. It is possible, therefore, to carry a regular course of study and still keep in full vigor and feel rejuvenated at the end of the season.

DATE OF OPENING

The course of instruction will open June 29th and close August 7th, use of laboratory being open longer to students desiring to continue work.

Five days each week will be devoted to regular exercises and one day left open for individual or special excursions.

It is desired that applications be made as early as possible, with statement of kind of work desired, even if it is impossible to begin with the opening day. It will be necessary to provide assistance, apparatus and supplies according to number in attendance, and the fees have been placed so low that proper provision is dependent on knowing the number in advance.

OPPORTUNITIES FOR INVESTIGATION

Following the plan which has been in operation for several years past, the laboratory will be open to properly qualified persons who may desire to engage in investigations of biological problems pertaining to the life of the locality. No fees will be charged, and table room, boats, aquaria, etc., will be supplied subject only to such provisions as may be necessary to make the facilities equally available to all. Each investigator will be expected to furnish his own microscope, cutting instruments, and special apparatus or reagents needed in his investigation unless otherwise arranged.

The laboratory will be open for investigators from June 15th to September 15th. Applications for table room should be made as early as possible, with indication of the time during which space will be desired.

ENROLLMENT FOR SUMMER OF 1902

INSTRUCTORS.

Herbert Osborn, Entomology, Invertebrate Morphology.
Francis L. Landacre, Zoology, Invertebrate Morphology.
John H. Schaffner, Botany, Ecology.
James S. Hine, Ornithology.
Harriet G. Burr, Botany.

STUDENTS AND INVESTIGATORS.

Brace, Edith M., A. B. (Nebraska), M. S. (Chicago), Adrian, Mich., Professor of Biology.
Burr, Harriet G., A. B. (O. S. U.), O. S. U., Fellow in Botany.
Burr, Mary, University of Michigan, Worthington, O., Student.
Cole, Leon J., A. B. (University of Michigan), Ann Arbor, Mich., U. S. Fish Commission.
Cook, Melvile T., A. B. (Stanford), A. M. (De Pauw), De Pauw University, Greencastle, Ind., Professor of Biology.
Detmers, Fredrika, B. S. (O. S. U.), M. S. (O. S. U.), High School, Columbus, O., Science Teacher.
Flynn, Maud, B. Sc. (O. S. U.), High School, Columbus, O., Science Teacher.
Foreman, J. W., B. Sc. (De Pauw), High School, Illinois, Science Teacher.
Harvey, Gertrude F., B. A. (Cincinnati University), Cincinnati, O.
Harvey, Ruth S. (Cincinnati University), Cincinnati, O., Teacher.
Holt, W. P., A. B. (Oberlin), Toledo, O., Science Teacher.
Hyde, R. L. (O. S. U.), Clarksburg, O., Student.
Metz, W. C. (O. S. U.), Newark, O., Student.
Morris, E. L., A. M. (Amherst), Washington, D. C., Professor of Biology.
Morse, Max W. (O. S. U.), Columbus, O., Student and Assistant.
Moseley, E. L., A. M. (University of Michigan), Sandusky, O., Professor of Science.
Porter, Minnie E. (O. S. U.), New Philadelphia, O., Student.
Quiroga, Modesto (O. S. U.), Buenos Ayres, Argentina, Student.
Rhoades, W. R., A. B. (Otterbein), Findlay, High School, Professor of Science and Assistant Principal.
Riddle, Lumina C., B. Sc. (O. S. U.), M. Sc. (O. S. U.), Columbus, O., Science Teacher.
Roller, Ernest, B. Sc. (De Pauw), Greencastle, Ind., Teacher.
Swezey, Otto H., A. B. (Lake Forest), M. Sc. (N. W. University), Evanston, Ill., Ins. Biology.
York, H. H. (De Pauw), Greencastle, Ind., Student.
Wells, W. E., Ph. B. (Iowa College), M. Sc. (Denison University), Antioch College, Yellow Springs, Professor of Biology.

Special inquiries regarding Zoology should be addressed to Prof. Herbert Osborn.

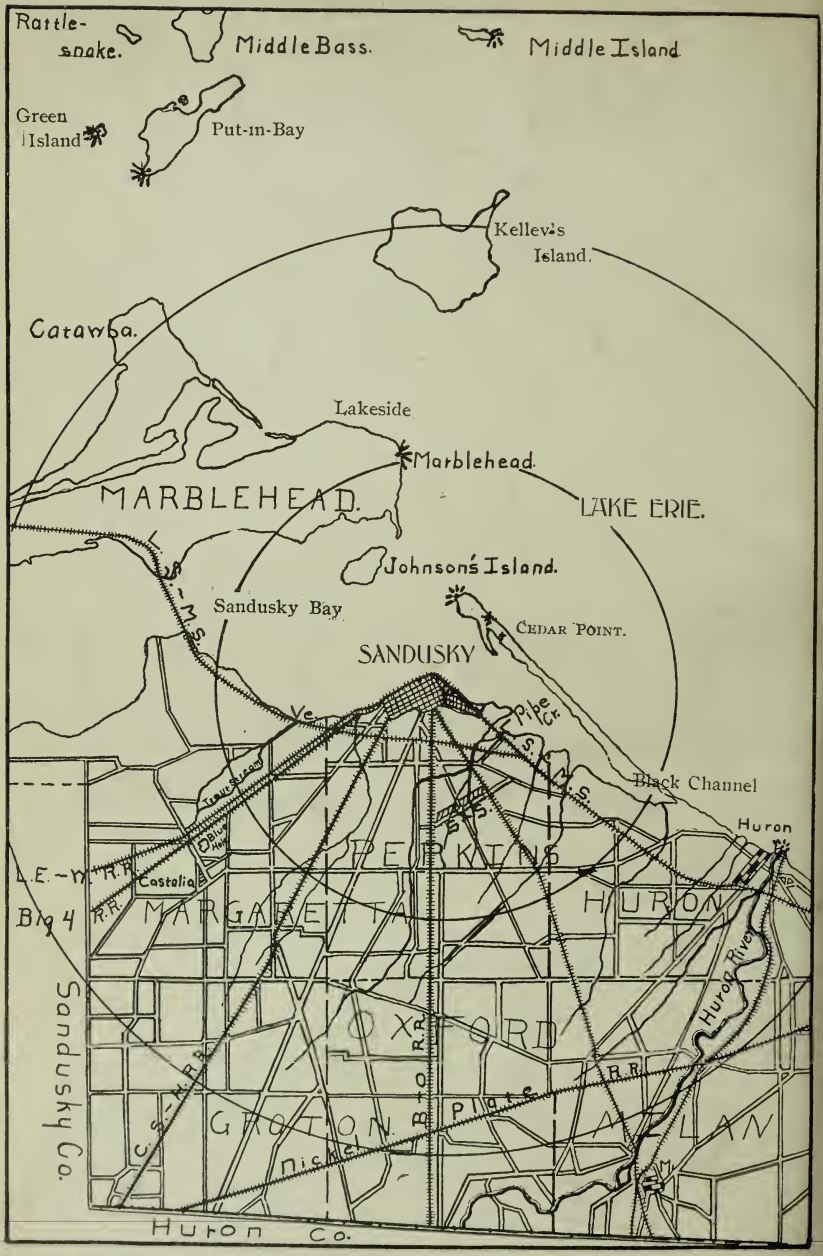
Special inquiries regarding work in Botany should be addressed to Prof. W. A. Kellerman.

Applications and correspondence relating to the laboratory in general should be addressed to the Director,

Prof. Herbert Osborn,

Ohio State University, Columbus.

Address, June 20th to Sept. 1st, Lake Laboratory, Sandusky, O.



Map of Sandusky and vicinity modified from map accompanying Moseley's "Sandusky Flora." Small circle at center indicates location of old laboratory near the water works. Circles show 5 and 10 mile radius from old laboratory.

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Ohio State University Bulletin

VOL. X SUPPLEMENT TO NO. 3

Lake Laboratory

Announcement

DECEMBER 14, 1905

PUBLISHED BY THE UNIVERSITY
COLUMBUS

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Lake Laboratory

The Lake Laboratory of the Ohio State University is designed to provide opportunity for the investigation of the biology of the lake region, and for giving certain courses of instruction in biological subjects.

WILLIAM OXLEY THOMPSON, D. D., LL. D., President of the University.

STAFF OF INSTRUCTORS FOR 1906.

HERBERT OSBORN, M. Sc., ...Director
Professor of Zoology and Entomology, Ohio State University.

F. L. LANDACRE, A. B.,.....General Zoology, Embryology
Associate Professor of Zoology, Ohio State University.

W. E. KELLICOTT, PH. D.,.....Experimental Zoology
Instructor Zoology, Barnard College, Columbia University.

L. B. WALTON, PH. D.,.....Invertebrate Morphology and Ichthyology
Professor of Biology, Kenyon College.

MALCOLM E. STICKNEY, A. M.,.....Botany and Ecology
Assistant Professor of Botany, Denison University.

EDWARD L. RICE, PH. D., ...
.....Ornithology and Comparative Anatomy
Professor of Zoology, Ohio Wesleyan University.

MRS. HARRIET GILBERT, B. S., ...Assistant
Teacher of Biology, Painesville High School.

LOCATION.

The Laboratory has a beautiful site on Cedar Point, located close to the waters of Lake Erie and Sandusky Bay which teem with animal and plant life. Extensive marshes, the river, native forest, sandy beach, and rocky islands are all within easy reach and furnish opportunities for study of life under greatly varied conditions. Put-in-Bay with the United States Fish Hatchery, Kelly's Island with its famous glacial grooves, and other points of great natural interest are easily reached by excursions and are visited in collecting or special trips. The extensive fishing industry centering at Sandusky affords special opportunity for study and investigation in Ichthyology.

The steamers of the Cedar Point Pleasure Resort Co., which run two or three times every hour during day and evening, furnish ready access to Sandusky and the excellent railroad and trolley systems centering there.

FACILITIES.

A new and commodious laboratory building, capable of accommodating at least one hundred students and investigators, gives excellent accommodations for the work. It is provided with tables, dark rooms, aquaria, water, and gas. Microscopes and other apparatus are supplied from the University.

Boats, collecting apparatus, dredges, seines, etc., are well supplied, and special attention will be given to the methods of collecting and field work.

The Cedar Point Pleasure Resort Co., which has generously granted the site for the laboratory building, also grants free transportation on its boats to persons enrolled at the laboratory.

Telephone service, both local and long distance, is available in the laboratory.

COURSES OF STUDY

ZOOLOGY AND ENTOMOLOGY.

a. General Zoology. Laboratory and field course with occasional lectures and quiz, and including dissection or microscopic study of type forms, aquaria and field studies with instruction in collecting and preparing material for laboratory use and permanent collections. Special attention will be given to fishes and food of fishes. Associate Professor Landacre.

b. Embryology. A study of mitosis, segmentation and germ layer formations of different types, but with special emphasis on the development of the fish. The course will be offered as far as possible from material collected at the laboratory, but some time will be devoted to technique. Students properly qualified may undertake the study of some embryological problem. Associate Professor Landacre.

c. Entomology. Field and laboratory course, including instruction in collecting, mounting, and identifying insects in connection with studies in life history and anatomy. Excellent opportunities for life history studies are offered both on aquatic and terrestrial forms. Professor Osborn.

d. Ichthyology. Special course devoted particularly to the lake fishes, their habits and food supplies. Professor Walton.

e. Ornithology. Field work, together with lectures on morphology and natural history of birds. In the field work especial attention will be devoted to the study of the shore and water birds, breeding habits, and the ecological conditions of the vicinity of the laboratory. *Each student should be provided with field glass or opera glass.* Professor Rice.

f. Invertebrate Morphology. An advanced course

including laboratory work on representative forms, investigations of special morphological problems, and a discussion of the classification and phylogenetic relationship of the various groups of invertebrates, with occasional lectures and quizzes. Professor Walton.

g. Experimental Zoology. Lecture and laboratory course. A review of the methods and results of the experimental study of zoology and evolution. The laboratory work may consist in the solution of a definite problem connected with the animal life of the region. Open to those who have had a course in general zoology. Dr. Kellicott.

h. Vertebrate Comparative Anatomy. Lectures and laboratory work. In view of the shortness of the term, a rather small number of types will be dissected in the laboratory, and the attention will be concentrated on certain selected organs and systems of organs. The work may be varied to suit individual requirements. Professor Rice.

i. Research Work. Students who desire, if properly qualified, may enter upon some faunal, ecological, or other problem. Professor Osborn.

BOTANY.

a. General Botany. Lecture, quiz, laboratory and field course, including the study of type forms from the lowest to the highest orders. The course will consist of collecting trips in the field where common species of each class are found, classification of the familiar forms, the study of the structure of interest in connection with the evolution and relationship of each group, and also methods of preparation and preservation for future use. Professor Stickney.

b. Ecology. Laboratory and field course accompanied by lectures, text work, and quiz. A general course in ecology with special attention to the conditions in evidence at Cedar Point and vicinity. Professor Stickney.

c. Special Work. Subject selected may be Ecology,

or some plant or small group in Systematic Botany. Professor Stickney.

NATURE STUDY.

While no separate courses are given under this title, the work presented in all the courses is based on direct contact with nature and furnishes the fundamental training and experience essential to the proper handling of such work. Teachers in secondary or grade schools having this work in hand or in prospect will find these courses admirably adapted to help them.

UNIVERSITY CREDITS.

It will be noticed that several of the advanced courses cover ground of the university courses. Students with university standing may secure university credits for work which is equivalent to such university courses. The opportunities for research or thesis work are also exceptionally good in certain lines.

METHODS.

Work will consist very largely of field observations, collections, and study of relation to environment, supplemented by laboratory dissections and microscopic examinations. The general courses are especially intended for the benefit of teachers who may wish to familiarize themselves with methods of field work and the manipulation of laboratory material. Special emphasis in all courses will be laid upon the importance of knowing the whole life of the organism.

FEES.

The total laboratory fee is fixed at $20 for a term of six weeks' instruction with privilege of continuing labora-

tory work at least two weeks after the lecture courses are completed. No enrollment will be made for less than a half term. Each course is expected to occupy half of the time available, unless it is elected to give the entire time to one subject; therefore each student, on payment of one fee, will be entitled to any two of the courses outlined under the courses of study, and the courses are so arranged that almost any two courses named may be taken without conflict of hours.

LIVING.

A limited number of students may be housed in the laboratory and applications for room will be filed in the order of their receipt. Each student is expected to furnish his own outfit, but no rental is charged for room. Room and board in Sandusky ranges from $3.50 to $4.50 per week. The hotels, cottages, tenting privileges, cafe and lunch rooms of Cedar Point afford a wide choice in manner of living. Mrs. Gilbert will have general supervision of the young women who choose to room at the laboratory and those rooming elsewhere will be free to advise with her at any time on matters pertaining to their comfort. Those who desire to secure rooms in Sandusky will be assisted if they will send a statement of the kind of accommodation they desire.

PHOTOGRAPHY.

The location affords fine opportunities for photographic work and those possessed of cameras will need no suggestion to bring them. A dark room affords opportunity for prompt development of negatives. Beginners will be assisted in acquiring the best results in their work either in connection with photographs for scientific purposes or for general landscape or scenic effects.

EXCURSIONS AND COLLECTING TRIPS.

From the nature of the locality a great number of delightful excursions are possible and many rich collecting

grounds are visited on these excursions. Special excursions are made on Saturdays. Black Channel, Lakeside, Blue Hole at Castalia, Kelly's Island, Hen and Chicken Island, Johnson's Island, Put-in-Bay, Green Island, the upper Sandusky Bay and River, gypsum beds near Gypsum, and the Life Saving Station at Marblehead are among the points usually visited.

GENERAL LECTURES.

Occasional lectures of a general character are given by members of the station staff, and others from outside talent are secured as occasion permits. During recent sessions the following subjects among others have been presented: "Physiographic Features of Sandusky Region," by Mr. E. L. Moseley; "The Harriman Alaskan Expedition," by Mr. Leon J. Cole, of the United States Fish Commission; "The Biological Features of the Florida Keyes," by Prof. E. L. Morris, of the United States Department of Agriculture; "Adaptation in Animal Life," by the Director; "Evolution of Plants in Time," by Prof. J. H. Schaffner; "Collecting in the Philippine Islands," by Mr. E. L. Moseley.

RECREATION.

In addition to the field work, collecting excursions, and out-door activities connected with the regular work, the opportunities for rowing, sailing, and bathing provide abundant means for physical exercise. The best of health has been the rule with those in attendance during past years.

PUBLICATIONS AND RECORDS.

A considerable number of publications based wholly or in part on investigations at the laboratory have been issued and a number of others are in preparation. These are expected in time to cover as fully as possible a systematic record of the plants and animals occurring in the vicinity of

the laboratory as well as results of morphological, embryological, or ecological studies. A card catalogue record of species occurring at Cedar Point has been started.

FREE TABLES FOR INVESTIGATORS.

The laboratory will be open, as heretofore, to properly qualified persons who may desire to engage in independent investigations of biological problems. No fees will be charged, and table room, boats, aquaria, etc., will be supplied subject only to such provisions as may be necessary to make the facilities equally available to all. Each investigator will be expected to furnish his own microscope, cutting instruments, and special apparatus or reagents needed in his investigation unless otherwise arranged.

It is presumed that all persons taking advantage of this provision are fully prepared to do independent work and, while suggestions and conferences may be freely granted, no claim upon the time of instructors is assumed.

The laboratory will be open for investigators from June 25th to September 15th. Applications for table room should be made as early as practicable, with indication of the time during which space will be desired.

Workers who may wish to use the laboratory for short periods to obtain material in any study will be cordially welcomed and given every facility possible, but must not expect instructors to break in upon regular duties to assist them.

DATE OF OPENING.

The course of instruction will open June 25th and close August 3d, the laboratory being open longer to students desiring to continue work.

Five days each week will be devoted to regular exercises and one day left open for individual or special excursions.

It is desired that applications be made as early as possible, with statement of kind of work desired.

HOW TO REACH THE LABORATORY.

Railroads of the Central Passenger Association sell season excursion tickets to Cedar Point, and week end or bi-weekly excursions from many points within a radius of 200 miles of Sandusky afford very cheap rates. For information as to such rates consult local railroad agents.

Excursions usually run direct to the docks and connect with the Cedar Point steamers. Other trains stop at their respective stations; the Big Four and the Pennsylvania are but a short walk, while the Baltimore and Ohio, Lake Shore, and the Lake Erie & Western are convenient to street cars. The Cedar Point dock is at the foot of Columbus avenue.

If trunks are brought it will save trouble to have them taken direct by boat from Sandusky to the Laboratory. By leaving checks at the Director's office or handing them to a representative of the Laboratory at the Cedar Point dock any delay or inconvenience may be avoided. It will also avoid extra expense and trouble if all who expect to arrive on Saturday will notify us in advance and turn in checks for baggage as promptly as possible.

ENROLLMENT FOR THE SUMMER OF 1905.

INSTRUCTORS.

Herbert Osborn, M. Sc., Research Courses, Entomology.
F. L. Landacre, A. B., General Zoology, Ornithology.
W. E. Kellicott, Ph. D., Experimental Zoology.
L. B. Walton, Ph. D., Invertebrate Morphology, Ichthyology.
Otto E. Jennings, B. Sc., Botany, Ecology.

STUDENTS AND INVESTIGATORS.

Arundel, John F., Student (O. S. U.), Cincinnati, Ohio.
Berger, Edw. W., Ph. B. (Baldwin Univ.), Ph. D. (Johns Hopkins Univ.), Berea, Ohio.

Brookover, Chas., B. Ped. (O. U.), M. S. (O. U.), Buchtel College, Akron, O.

Dresbach, Melvin, B. S. (O. S. U.), M. S. (O. S. U.), M. D. (O. M. U.), Columbus, Ohio.

Evans, Wm. W., Jr., Student, Chillicothe, Ohio.

Gilbert, Mrs. Harriet, B. S. (O. W. U.), Painesville, Ohio.

Halstead, Arthur, Student, Gambier, Ohio.

Halstead, Harbeck, Student, Gambier, Ohio.

Herms, W. B., B. S. (German Wallace College), Berea, O.

Himebaugh, Oscar, Student, Suffeld, Ohio.

Hixon, A. H., Student (Denison Univ.), Ada, Ohio.

Hoyer, R. N., Student (O. S. U.), Columbus, Ohio.

Jackson, C. F., A. B. (DePauw), LaFayette, Ind.

Jackson, Mrs. C. F., Student (DePauw Univ.), LaFayette, Ind.

Kock, H. E., M. A. (Cin. U.), M. D. (Cin. Col. Med. and Surg.), Cincinnati, Ohio.

Mark, Miss Clara G., Student (O. S. U.), Fultonham, Ohio.

McCleary, F. E., Student (O. S. U.), Connorville, Ohio.

McClure, R. D., A. B. (O. S. U.), Columbus, Ohio.

Pew, Wm. H., Student, Youngstown, Ohio.

Riddle, Miss L. C., B. S. (O. S. U.), M. Sc. (O. S. U.), Ph. D. (O. S. U.), Columbus, Ohio.

Smith, G. D., B. Sc. (O. W. U.), Akron, Ohio.

Smith, Orma, Student, Jamestown, Ohio.

Stuart, D. D., Student, Lebanon, Ohio.

Surface, F. M., A. B. (O. S. U.), A. M. (O. S. U.), Eaton, Ohio.

Warwick, H. S., Student, Waynesville, Ohio.

Young, Robert A., Student, Columbus, Ohio.

Application, and correspondence relating to the laboratory should be addressed to the Director,

PROFESSOR HERBERT OSBORN,
Ohio State University,
Columbus, Ohio.

Address June 25th to September 1st,
Lake Laboratory, Sandusky, Ohio.

THE OHIO STATE UNIVERSITY BULLETIN is issued fifteen times during the Academic year, monthly in October, November, and June, and bi-weekly in December, January, February, March, April, and May. Application has been made for entry as second class matter at the Post Office at Columbus, Ohio.

These include: Reports of University officers, the catalogue and announcements of the University, the colleges of Agriculture and Domestic Science, Arts, Philosophy, and Science, Engineering, Law, Pharmacy, and Veterinary Medicine, the Graduate School, the Summer Term, Departments of Instruction, etc.

NOTE:—In requesting any of the above Bulletins, address the Secretary University Faculty, Ohio State University, Columbus, Ohio.

VOLUME XIII NUMBER 9

Ohio State University Bulletin

Lake Laboratory

January 28, 1909

PUBLISHED BY THE UNIVERSITY AT COLUMBUS

Entered as second-class matter November 17, 1905, at the postoffice at Columbus, Ohio, under Act of Congress, July 16, 1894.

LAKE LABORATORY

The Lake Laboratory of the Ohio State University, located on Cedar Point near Sandusky, is designed to provide a meeting ground for teachers and students of biology, to afford opportunity for the investigation of the biology of the lake region, and for giving certain courses of instruction in biological subjects.

LAKE LABORATORY

Staff of Officers and Instructors for 1909

William Oxley Thompson, D. D., LL. D.,
President of the University

Herbert Osborn, M. Sc., ... Director
Professor of Zoology and Entomology.

F. L. Landacre, B. A., ... Acting Director
General Zoology, Embryology
Professor of Zoology and Entomology.

E. L. Rice, Ph. D., Comparative Anatomy, Ornithology
Professor of Zoology, Ohio Wesleyan University.

John H. Schaffner, M. A., M. S., ... Ecology
Associate Professor of Botany.

Malcolm E. Stickney, A. M., ... Botany
Professor of Botany, Denison University.

L. B. Walton, Ph. D.,
Experimental Zoology, Aquatic Biology
Professor of Biology, Kenyon College.

Charles Brookover, B. Ped., M. S.,
Invertebrate Morphology, Ichthyology
Professor of Biology, Buchtel College.

J. C. Hambleton, M. A., ... Entomology
East High School, Columbus.

Courses of Study

ZOOLOGY AND ENTOMOLOGY

a. GENERAL ZOOLOGY. Especially for Teachers. Laboratory and field courses with occasional lectures and quiz, and including dissection or microscopic study of type forms, aquaria and field studies with instruction in collecting and preparing material for laboratory use and permanent collections. Professor LANDACRE.

b. EMBRYOLOGY. A study of mitosis, segmentation, and germ layer formations of different types, but with special emphasis on the development of the fish. The course will be offered as far as possible from material collected at the laboratory, but some time will be devoted to technique. Students properly qualified may undertake the study of some embryological problem. Professor LANDACRE.

c. ENTOMOLOGY. Field and laboratory course, including instruction in collecting, mounting, and identifying insects in connection with studies in life history and anatomy. Excellent opportunties for life-history studies are offered both on aquatic and terrestrial forms. Mr. HAMBLETON.

d. ICHTHYOLOGY. Special course devoted particularly to the lake fishes, their habits and food supplies. Professor BROOKOVER.

e. ORNITHOLOGY. Field work, together with lectures on morphology and natural history of birds. In the field work especial attention will be devoted to the study of the shore, swamp, and water birds, breeding habits, and the ecological conditions of the vicinity of the laboratory. *Each student should be provided with field glass or opera glass.* Professor RICE.,

f. INVERTEBRATE MORPHOLOGY. An advanced course including laboratory work on representative forms, investigations of special morpohological problems, and a discussion of the classification and phylogenic relationship of the various groups of invertebrates, with occasional lectures and quizzes. Professor BROOKOVER.

g. EXPERIMENTAL ZOOLOGY. Lecture and laboratory course. A review of the methods and results of the experimental study of zoology and evolution, with special reference to later work on variation and heredity. A study of Mendel's Law will be undertaken with its application to animal breeding from both the practical and theoretical viewpoint. The laboratory work will consist in the experimental study of certain animals of the region with relation to their variation, environment, breeding habits and growth, including a study of the tropisms. Open to those who have had a course in general zoology. Professor WALTON.

h. VERTEBRATE COMPARATIVE ANATOMY. Lectures and laboratory work. In view of the shortness of the term, a rather small number of types will be dissected in the laboratory, and the attention will be concentrated on certain selected organs and systems of organs. The work may be varied to suit individual requirements. Professor RICE.

i. RESEARCH WORK. Students who desire, if properly qualified, may enter upon some faunal, ecological, or other problem, under the direction of some one of the professors present.

j. AQUATIC BIOLOGY. This course will deal primarily with the fresh water forms of life occuring in Sandusky Bay, paying particular attention to the micro-organisms of both the animal and plant kingdom. After obtaining a general knowledge of the representatives of the various classes of organisms, each student will select one form and

study it as exhaustively as time permits. Plankton and plankton methods will receive due consideration. Throughout the course attention will be paid to the technique of collecting and preparing material. It is desirable although not absolutely necessary, that students taking the course possess a reading knowledge of German and French. Occasional lectures and quizzes. Professor WALTON.

BOTANY

a. GENERAL BOTANY. Especially for teachers. A course in morphology and biology of plants, including a study, in natural surroundings so far as possible of type forms from the lowest to the highest orders. The course will consist of collecting trips in the field where common species of each class are found, and a study in the laboratory of those features of structure and reproduction which are of interest in connection with the evolution and relationships of each group. Attention is given to methods of preparation and preservation for future use. Professor STICKNEY.

b. ECOLOGY. Field and laboratory course, accompanied by lectures, quiz, and consultation of the literature. A study of the struggle for existence among plants, as shown by their reactions and adaptations to the various factors of their environment—water, light, soil, temperature, etc. The identification of trees, shrubs, and herbaceous plants, and their grouping into societies, forms a part of the work. Special attention is given to the peculiar conditions in evidence at Cedar Point and vicinity. Professor SCHAFFNER.

c. SPECIAL WORK. Subject selected may be Ecology, Morphology, Systematic Botany, or special work on Algae or some other group of plants. Professor STICKNEY, Professor SCHAFFNER.

General Information

LOCATION

The Laboratory has a beautiful site on Cedar Point, located close to the waters of Lake Erie and Sandusky Bay which teem with animal and plant life. Extensive marshes, the river, native forest, sandy beach, and rocky islands are all within easy reach and furnish opportunities for study of life under greatly varied conditions. Put-in-Bay with the United States Fish Hatchery, Kelly's Island with its famous glacial grooves, and other points of great natural interest are easily reached by excursions and are visited in collecting or special trips. The extensive fishing industry centering at Sandusky affords special opportunity for study and investigation in Ichthyology.

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Boats, collecting apparatus, dredges, seines, etc., are furnished and special attention will be given to the methods of collecting and field work.

UNIVERSITY CREDIT

It will be noticed that several of the advanced courses cover the ground of university courses. Students with university standing may secure credit for such work. The opportunities for research or thesis work are also exceptionally good in certain lines.

CREDITS AT OTHER INSTITUTIONS

Credits for work at the laboratory are accepted for college credit at a number of different institutions; among those in Ohio which have given or have agreed to give such credits are Kenyon, Denison, Oberlin, Ohio Wesleyan, Buchtel, Miami, and Cincinnati. Others will no doubt agree to such acceptance on application from students interested.

METHODS

Work will consist very largely of field observations, collections, and study of relation of organisms to environment, supplemented by laboratory dissections and microscopic examinations. The general courses especially are intended for the benefit of teachers who may wish to familiarize themselves with methods of field work and the manipulation of laboratory material. Special emphasis in all courses will be laid upon the importance of knowing the whole life of the organism.

FEES

The total laboratory fee is fixed at $20 for a term of six weeks' instruction with privilege of continuing laboratory work at least two weeks after the lecture courses are completed. No enrollment will be made for less than a half term. Each course is expected to occupy half of the time available, unless it is elected to give the entire time to one subject; therefore each student, on payment of one fee, will be entitled to any two of the courses outlined under the courses of study, and the courses are so arranged that almost any two courses named may be taken without conflict of hours.

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A limited number of students may be housed in the laboratory, and applications for room will be filed in the order of their receipt. Each student is expected to furnish

his own outfit, but no rental is charged for room. Room and board in Sandusky ranges from $3.50 to $4.50 per week. The hotels, cottages, tenting privileges, café and lunch rooms of Cedar Point afford a wide choice in manner of living. Mrs. Brookover will be present during the session, and young women who choose to room at the laboratory will be free to advise with her on matters pertaining to their welfare. Those who desire to secure rooms in Sandusky will be assisted if they will send a statement of the kind of accommodations they desire.

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EXCURSIONS AND COLLECTING TRIPS

From the nature of the locality a great number of delightful excursions are possible, and many rich collecting grounds are visited on these excursions. Special excursions are made on Saturdays. Black Channel, Lakeside, Blue Hole at Castalia, Kelly's Island, Hen and Chicken Island, Johnson's Island, Put-in-Bay, Green Island, the upper Sandusky Bay and River, gypsum beds near Gypsum, and the Life Saving Station at Marblehead are among the points usually visited.

GENERAL LECTURES

Lectures of a general character are given by members of the station staff, and others are secured from outside persons when possible. During the last session such lectures were given by Prof. Lynds Jones, of Oberlin, on A

Trip to Porto Rico; Prof. S. H. Williams, of Miami University, on Preparation for Teaching of Zoology in Secondary Schools; Prof. Frank Carney, of Denison University, on The Relation of Geology to Evolution; Prof. E. L. Rice, of Ohio Wesleyan University, on Zoological Laboratories in America and Europe; Dr. C. B. Bliss, of Sandusky, on Binocular Vision.

NATURE STUDY

While no separate courses are given under this title, the work presented in all the courses is based on direct contact with nature and furnishes the fundamental training and experience essential to the proper handling of such work. Teachers in secondary or grade schools having this work in hand or in prospect will find these courses admirably adapted to help them.

RECREATION

In addition to the field work, collecting excursions, and outdoor activities connected with the regular work, the opportunities for rowing, sailing, and bathing provide abundant means for physical exercise. The best of health has been the rule with those in attendance during past years.

PUBLICATONS AND RECORDS

A considerable number of publications based wholly or in part on investigations at the laboratory have been issued and a number of others are in preparation. These are expected in time to cover as fully as possible a systematic record of the plants and animals occuring in the vicinity of the laboratory as well as results of morphological, embryological, or ecological studies. A partial list is given below. A card catalogue record of species occuring at Cedar Point which has been in process of formation serves to show the known species and is constantly enlarging.

PUBLICATIONS BASED WHOLLY OR IN PART UPON WORK DONE AT THE LAKE LABORATORY

Rotifera of Sandusky Bay. D. S. Kellicott. Trans. Am. Mic. Soc.

The Odonata of Ohio. D. S. Kellicott, O. Ac. Sci., S. P. 2, 1-116, 4 pl.

The Fishes of Ohio. Raymond C. Osborn, O. Ac. Sci., S. P. 4, 1-104.

Galls and Insects Producing Them. Melville Thurston Cook, parts 1 to 9, O. Nat., II, 263; III, 419; IV, 125.

Tabanidæ of Ohio. James S. Hine, O. Ac. Sci., S. P. 5, 1-57, 2 pl.

Observations on Hymenopterous Parasites of Certain Fulgoridæ. Otto H. Swezey, O. Nat., III, 444-452.

A List of the Orthoptera of Ohio. C. S. Mead, O. Nat., IV, 109-112.

The Coccidae of Ohio. James G. Sanders, O. Ac. Sci., S. P. 8, 65 pp., 9 pl., 86 fig.

Batrachians and Reptiles of Ohio. Max Morse, Pr. O. Ac. Sci., IV, 91-144.

An Ecological and Experimental Study of Sarcophagidæ with Relation to Lake Beach Debris. W. B. Herms. Jour. Exp. Zool., IV, 45-83.

On the Place of Origin and Method of Distribution of Taste Buds in Ameiurus Melas. F. L. Landacre, Jour. Comp. Neur. and Psychol., XVII, 1-66.

The Birds of Cedar Point, Sandusky, Ohio. R. L. Baird, O. Nat., Vol. II, p. 143.

Notes on Bird Life of Cedar Point. R. F. Griggs, O. Nat., Vol. I, p. 91.

Dragon Flies of Sandusky. James S. Hine, O. Nat., Vol. I, p. 94.

Sponges and Bryozoans of Sandusky. F. L. Landacre, O. Nat., Vol. I, p. 96.

Zoological Notes. Herbert Osborn, O. Nat., Vol. I, p. 86.

Notes on the Flora of Sandusky. W. A. Kellerman, O. Nat., Vol. I, p. 82.

Variations in the Water Snake. Max Morse, O. Nat., Vol. II, p. 183.

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The Breeding Habits of the Myriopod, Fontaria Indianæ. Max Morse, O. Nat., Vol. 4, p. 161.

The Embryo Sack and Embryo of the Nelumbo. H. H. York, O. Nat., Vol. 4, p. 167.

Flora of Cedar Point. W. A. Kellerman and O. E. Jennings, O. Nat., Vol. 4, p. 186.

Flora of Hen and Chicken Islands 1903. W. A. Kellerman. O. Nat., Vol. 4, p. 190.

Report of Progress on Study of Hemiptera of Ohio and Description of New Species. Herbert Osborn, O. Nat., Vol. 5, p. 273.

Notes on the Morphology of Philotria. Lumina C. Riddle, O. Nat., Vol. V, 304.

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An Ecological Classification of the Vegetation of Cedar Point. Otto E. Jennings, Ohio Naturalist, Vol. VIII, 291.

The Protozoa of Sandusky Bay and Vicinity. F. L. Landacre, Ohio Acad. Sci., S. P. 13.

FREE TABLES FOR INVESTIGATORS

The laboratory will be open, as heretofore, to properly qualified persons who may desire to engage in independent investigations of biological problems. No fees will be charged, and table room, boats, aquaria, etc., will be supplied subject only to such provisions as may be necessary to make the facilities equally available to all. Each investi-

gator will be expected to furnish his own microscope, cutting instruments, and special apparatus or reagents needed in his investigation unless otherwise arranged.

It is presumed that all persons taking advantage of this provision are fully prepared to do independent work and, while suggestions and conferences may be freely granted, no claim upon the time of instructors is assumed.

The laboratory will be open for investigators from June 21st to September 9th. Applications for table room should be made as early as practicable, with indications of the time during which space will be desired.

Workers who may wish to use the laboratory for short periods to obtain material in any study will be cordially welcomed and given every facility possible, but must not expect instructors to break in upon regular duties to assist them. Among those who used the laboratory for investigation during the last summer were Mr. Otto E. Jennings, Carnegie Museum, Pittsburg, Pa.; Professor S. H. Williams, Miami University; Mr. E. H. Foote and Miss Clara Davies, Denison University; Mr. Dye, University of Wisconsin; Mr. R. F. Griggs and Dr. A. Dachnowski, Ohio State University.

DATE OF OPENING

The course of instruction will open June 21 and close July 30, the laboratory being open longer to students desiring to continue work.

Five days each week will be devoted to regular exercises and one day left open for individual or special excursions.

It is desired that applications be made as early as possible, with statement of kind of work desired.

TRANSPORTATION AND COMMUNICATION

Railroads of the Central Passenger Association sell season excursion tickets to Cedar Point, and week end or biweekly excursions from many points within a radius of 200

miles of Sandusky afford very cheap rates. For information as to such rates, consult local railroad agents.

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The Cedar Point Pleasure Resort Company, which generously granted the site for the laboratory building gives free transportation on its boats to persons enrolled at the laboratory. The steamers run two or three times every hour during the day and evening, furnishing ready access to Sandusky.

Application and correspondence relating to the laboratory should be addressed to the Acting Director.

PROFESSOR F. L. LANDACRE,
Ohio State University,
Columbus, Ohio.

Address after June 21st, Lake Laboratory, Sandusky, Ohio.

Adapted from map accompanying Moseley's "Sandusky Flora."

The Ohio State University Bulletin is issued at least fifteen times during the Academic year, monthly in October, November, and June, and bi-weekly in December, January, February, March, April, and May.

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VOLUME XV NUMBER 8

The Ohio State University Bulletin

Lake Laboratory

January, 1911

PUBLISHED BY THE UNIVERSITY AT COLUMBUS

Entered as second-class matter November 17, 1905, at the postoffice at Columbus, Ohio, under Act of Congress, July 16, 1894.

LAKE LABORATORY

The Lake Laboratory of the Ohio State Universit located on Cedar Point near Sandusky, is designed to pr vide a meeting ground for teachers and students of biolog to afford opportunity for the investigation of the biolo of the lake region, and for giving certain courses of i struction in biologicial subjects.

LAKE LABORATORY

Staff of Officers and Instructors for 1911.

WILLIAM OXLEY THOMPSON, D. D., LL. D.,
PRESIDENT OF THE UNIVERSITY

HERBERT OSBORN, M. Sc., ... DIRECTOR
Professor of Zoology and Entomology.

FRANCIS L. LANDACRE, B. A., ...
Aquatic Biology, Experimental Zoology.
Professor of Zoology and Entomology.

CHARLES BROOKOVER, B. Ped., Ph. D., ...
General Zoology, Invertebrate Morphology.
Professor of Biology, Buchtel College.

GEORGE E. COGHILL, A. M., ...
Comparative Anatomy, Embryology.
Professor of Zoology, Denison University.

OTTO E. JENNINGS, B. Sc., ... Ecology
Assistant Curator, Carnegie Museum, Pittsburg.

EDWARD L. FULLMER, M. Sc., ... Botany
Professor of Natural Science, Baldwin University.

* . . . . . Ornithology, Ichthyology.

*Not filled at time of printing this bulletin.

Courses of Study

ZOOLOGY AND ENTOMOLOGY

a. GENERAL ZOOLOGY. Especially for Teachers. Laboratory and field courses with occasional lectures and quiz, and including dissection or microscopic study of type forms, aquaria and field studies with instruction in collecting and preparing material for laboratory use and permanent collections. Professor BROOKOVER.

b. EMBRYOLOGY. A study of mitosis, segmentation, and germ layer formations of different types, but with special emphasis on the development of the fish. The course will be offered as far as possible from material collected at the laboratory. Students properly qualified may undertake the study of some embryological problem. Professor COGHILL.

c. ENTOMOLOGY. Field and laboratory course, including instruction in collecting, mounting, and identifying insects in connection with studies in life history and anatomy. Excellent opportunities for life-history studies are offered both on aquatic and terrestrial forms. Professor OSBORN.

d. ICHTHYOLOGY. Special course devoted particularly to lake fishes, their habits and food supplies.

e. ORNITHOLOGY. Field work, together with lectures on morphology and natural history of birds. In the field work especial attention will be devoted to the study of the shore, swamp, and water birds, breeding habits, and the ecological conditions of the vicinity of the laboratory. *Each student should be provided with field glass or opera glass.*

f. INVERTEBRATE MORPHOLOGY. An advanced course including laboratory work on representative forms, investigations of special morphological problems, and a discussion of the classification and phylogenic relationship of the various groups of invertebrates, with occasional lectures and quizzes. Professor BROOKOVER.

g. EXPERIMENTAL ZOOLOGY. Lecture and laboratory course. A review of the methods and results of the experimental study of zoology and evolution, with special reference to later work on variation and heredity. A study of Mendel's Law will be undertaken with its application to animal breeding from both the practical and theoretical viewpoint. The laboratory work will consist in the experimental study of certain animals of the region with relation to their variation, environment, breeding habits and growth, including a study of the tropisms. Open to those who have had a course in general zoology. Professor LANDACRE.

h. VERTEBRATE COMPARATIVE ANATOMY. Lectures and laboratory work. In view of the shortness of the term, a rather small number of types will be dissected in the laboratory, and the attention will be concentrated on certain selected organs and systems of organs. The work may be varied to suit individual requirements. Professor COGHILL.

i. RESEARCH WORK. Students who desire, if properly qualified, may enter upon some faunal, ecological, or other problem, under the direction of some one of the professors present.

j. AQUATIC BIOLOGY. This course will deal primarily with the fresh water forms of life occurring in Sandusky Bay, paying particular attention to the micro-organisms of both the animal and plant kingdom. After obtaining a general knowledge of the representatives of the various classes of organisms, each student will select one form and

study it as exhaustively as time permits. Plankton and plankton methods will receive due consideration, Throughout the course attention will be paid to the technique of collecting and preparing material. It is desirable, although not absolutely necessary, that students taking the course possess a reading knowledge of German and French. Occasional lectures and quizzes. Professor LANDACRE.

BOTANY

a. GENERAL BOTANY. Especially for teachers. A course in morphology and biology of plants including a study, in natural surroundings so far as possible, of type forms from the lowest to the highest orders. The course will consist of collecting trips in the field where common species of each class are found, and a study in the laboratory of those features of structure and reproduction which are of interest in connection with the evolution and relationships of each group. Attention is given to methods of preparation and preservation for future use. Professor FULLMER.

b. ECOLOGY. Field and laboratory course, accompanied by lectures, quiz, and consultation of the literature. A study of the struggle for existence among plants, as shown by their reactions and adaptations to the various factors of their environment—water, light, soil, temperature, etc. The identification of trees, shrubs, and herbaceous plants, and their grouping into societies, forms a part of the work. Special attention is given to the peculiar conditions in evidence at Cedar Point and vincinity. Mr. JENNINGS.

c. SPECIAL WORK. Subject selected may be Ecology, Morphology, Systematic Botany, or special work on Algae or some other group of plants. Professor FULLMER, Mr. JENNINGS.

General Information

LOCATION

The Laboratory has a beautiful site on Cedar Point, located close to the waters of Lake Erie and Sandusky Bay which teem with animal and plant life. Extensive marshes, the river, native forest, sandy beach, and rocky islands are all within easy reach and furnish opportunities for study of life under greatly varied conditions. Put-in-Bay with the United States Fish Hatchery, Kelly's Island with its famous glacial grooves, and other points of great natural interest are easily reached by excursions and are visited in collecting or special trips. The extensive fishing industry centering at Sandusky affords special opportunity for study and investigation in Ichthyology.

FACILITIES

A new and commodious laboratory building, capable of accommodating at least one hundred students and investigators, gives excellent accommodations for the work. It is provided with tables, dark rooms, aquaria, water, and gas. Microscopes and other apparatus are supplied from the University.

Boats, collecting apparatus, dredges, seines, etc., are furnished, and special attention will be given to the methods of collecting and field work.

UNIVERSITY CREDIT

It will be noticed that several of the advanced courses cover the ground of university courses. Students with university standing may secure credit for such work. The opportunities for research or thesis work are also exceptionally good in certain lines. Credit at the University will

be given on the following basis: One lecture each day and four hours' laboratory work, including the work laid out for Saturday, will give a student credit for six semester hours. When arrangements are made for continuing the work for two additional weeks nine semester hours' credit can be secured.

CREDITS AT OTHER INSTITUTIONS

Credits for work at the Laboratory are accepted for college credit at a number of different institutions; among those in Ohio which have given or have agreed to give such credits are Kenyon, Denison, Oberlin, Ohio Wesleyan, Buchtel, Miami, and Cincinnati. Others will no doubt agree to such acceptance on application from students interested.

METHODS

Work will consist very largely of field observations, collections, and study of relation of organisms to environment, supplemented by laboratory dissections and microscopic examinations. The general courses especially are intended for the benefit of teachers who may wish to familiarize themselves with methods of field work and the manipulation of laboratory material. Special emphasis in all courses will be laid upon the importance of knowing the whole life of the organism.

FEES

The total Laboratory fee is fixed at $20 for a term of six weeks' instruction. No enrollment will be made for less than half a term. Each course is expected to occupy half of the time available, unless it is elected to give the entire time to one subject; therefore each student, on payment of one fee, will be entitled to any two of the courses outlined under the courses of study, and the courses are so arranged that almost any two courses named may be taken without conflict of hours.

LIVING

A limited number of students may be housed in the Laboratory, and applications for room will be filed in the order of their receipt. Each student is expected to furnish his own outfit, but no rental is charged for room. Room and board in Sandusky ranges from $3.50 to $4.50 per week. The hotels, cottages, tenting privileges, and lunch rooms of Cedar Point afford a wide choice in manner of living. Mrs. Brookover will be present during the session, and young women who choose to room at the Laboratory will be free to advise with her on matters pertaining to their welfare. Those who desire to secure rooms in Sandusky will be assisted if they will send a statement of the kind of accommodations they desire.

EXCURSIONS AND COLLECTING TRIPS

From the nature of the locality a great number of delightful excursions are possible, and many rich collecting grounds are visited on these excursions. Special excursions are made on Saturdays. Black Channel, Lakeside, Blue Hole at Castalia, Kelly's Island, Hen and Chicken Islands, Johnson's Island, Put-in-Bay, Green Island, the upper Sandusky Bay and River, gypsum beds near Gypsum, and the Life Saving Station at Marblehead are among the points usually visited.

GENERAL LECTURES

Lectures of a general character are given by members of the station staff, and other lecturers are secured from outside when possible. These lectures are given weekly or oftener and are on topics of general interest. Each member of the instructional force gives at least one lecture.

NATURE STUDY

While no separate courses are given under this title, the work presented in all the courses is based on direct contact with nature and furnishes the fundamental training and experience essential to the proper handling of such work. Teachers in secondary or grade schools having this work in hand or in prospect will find these courses admirably adapted to help them.

RECREATION

In addition to the field work, collecting excursions, and outdoor activities connected with the regular work, the opportunities for rowing, sailing, and bathing, provide abundant means for physical exercise. The best of health has been the rule with those in attendance during past years.

PUBLICATIONS AND RECORDS

A considerable number of publications based wholly or in part on investigations at the Laboratory have been issued and a number of others are in preparation; These are expected in time to cover as fully as possible a systematic record of the plants and animals occurring in the vicinity of the Laboratory as well as results of morphological, embryological, or ecological studies. A partial list is given below. A card catalogue record of species occurring at Cedar Point which has been in process of formation serves to show the known species, and is constantly enlarging.

PUBLICATIONS BASED WHOLLY OR IN PART UPON WORK DONE AT THE LAKE LABORATORY

Rotifera of Sandusky Bay. D. S. Kellicott. Trans. Am. Mic. Soc.

The Odonata of Ohio. D. S. Kellicott, O. Ac. Sci., S. P. 2, 1-116, 4 pl.

The Fishes of Ohio. Raymond C. Osborn, O. Ac. Sci., S. P. 4, 1-104.

Galls and Insects Producing Them. Melville Thurston Cook, parts 1 to 9, O. Nat., II, 263; III, 419; IV, 125.

Tabanidæ of Ohio. James S. Hine, O. Ac. Sci., S. P. 5, 1-57, 2 pl.

Observation on Hymenopterous Parasites of Certain Fulgoridæ. Otto H. Swezey, O. Nat., III, 444-452.

A List of the Orthoptera of Ohio. C. S. Mead O. Nat, IV, 109-112.

The Coccidæ of Ohio. James G. Sanders, O. Ac. Sci., S. P. 8, 65 pp., 9pl., 86 fig.

Batrachians and Reptiles of Ohio, Max Morse, Pr. O. Ac. Sci., IV, 91-144.

An Ecological and Experimental Study of Sarcophagidæ with Relation to Lake Beach Debris. W. B. Herms, Jour. Exp. Zool. IV, 45-83.

On the Place of Origin and Method of Distribution of Taste Buds in Ameiurus Melas. F. L. Landacre, Jour. Comp. Neur. and Psychol., XVII, 1-66.

The Birds of Cedar Point, Sandusky, Ohio. R. L. Baird, O. Nat., Vol. II, p. 143.

Notes on Bird Life of Cedar Point. R. F. Griggs, O. Nat., Vol. I, p. 91.

Dragon Flies of Sandusky. James S. Hine, O. Nat., Vol. I, p, 94.

Sponges and Bryozoans of Sandusky. F. L. Landacre, O. Nat., Vol, I, p. 96.

Zoological Notes. Herbert Osborn, O. Nat., Vol. I, p. 86.

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be made as early as practicable, with indications of the time during which space will be desired.

Workers who may wish to use the laboratory for short periods to obtain material in any study will be cordially welcomed and given every facility possible, but must not expect instructors to break in upon regular duties to assist them.

DATE OF OPENING

The course of instruction will open June 19th and close July 28th, the Laboratory being open longer to students desiring to obtain additional credit.

Five days each week will be devoted to regular exercises and one day left open for individual or special collecting trips.

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TRANSPORTATION AND COMMUNICATION

Railroads of the Central Passenger Association sell season excursion tickets to Cedar Point, and week end or bi-weekly excursions from many points within a radius of 200 miles of Sandusky afford very cheap rates. For information as to such rates, consult local railroad agents.

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If trunks are brought it will save trouble to have them taken direct by boat from Sandusky to the Laboratory. By leaving checks at the Director's office or handing them to a representative of the Laboratory at the Cedar Point dock, delay or inconvenience may be avoided. It will also avoid extra expense and trouble if all who expect to arrive on

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Adapted from map accompanying Mosley's "Sandusky Flora"

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VOLUME XVI NUMBER 10

The Ohio State University Bulletin

The Lake Laboratory

November, 1911

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PUBLISHED BY THE UNIVERSITY AT COLUMBUS

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THE OHIO STATE UNIVERSITY

The Ohio State University, located at Columbus, is a part of the public educational system maintained by the State. It comprises seven colleges and a graduate school:

The College of Agriculture,
The College of Arts, Philosophy and Science,
The College of Education,
The College of Engineering,
The College of Law,
The College of Pharmacy,
The College of Veterinary Medicine,
The Graduate School.

The University publishes a bulletin describing the work of each of these colleges. Copies may be obtained by addressing W. E. Mann, University Editor, Columbus, Ohio. Persons desiring information are invited to send for the bulletin of that college in which they are interested.

This bulletin is devoted exclusively to a description of the work offered by the Department of Zoology and Entomology at the Lake Laboratory.

The Lake Laboratory of the Ohio State University, located on Cedar Point near Sandusky, is designed to provide a meeting ground for teachers and students of biology, to afford opportunity for the investigation of the biology of the lake region, and for giving certain courses of instruction in biologicial subjects.

THE LAKE LABORATORY

Staff of Officers and Instructors for 1912

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PRESIDENT OF THE UNIVERSITY

HERBERT OSBORN, M. Sc., ... DIRECTOR
Professor of Zoology and Entomology.

WM. M. BARROWS, B. S., S. M., ...
Aquatic Biology, Experimental Zoology.
Assistant Professor of Zoology and Entomology.

EDWARD L. RICE, Ph. D., ...
Comparative Anatomy, Invertebrate Morphology.
Professor of Zoology, Ohio Wesleyan University.

GEORGE E. COGHILL, A. M., Ph. D., ...
Ichthyology, Embryology.
Professor of Zoology, Denison University.

EDWARD L. FULLMER, M. Sc., ... Botany
Professor of Natural Science, Baldwin University.

CHARLES G. SHATZER, A. M., ...
Ornithology, General Zoology.
Professor of Biology and Geology Wittenberg College.

LOUIS H. PAMMEL, Ph. D., ... Ecology
Professor of Botany, Iowa State College.

LOOKING SOUTH FROM THE LABORATORY

General Information

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The Laboratory has a beautiful site on Cedar Point, located close to the waters of Lake Erie and Sandusky Bay which teem with animal and plant life. Extensive marshes, the river, native forest, sandy beach, and rocky islands, are all within easy reach and furnish opportunities for study of life under greatly varied conditions. Put-in-Bay with the United States Fish Hatchery, Kelly's Island with its famous glacial grooves, and other points of great natural interest are easily reached by excursions and are visited in collecting or special trips. The extensive fishing industry centering at Sandusky affords special opportunity for study and investigation in Ichthyology.

FACILITIES

A well equipped laboratory building, capable of accommodating at least one hundred students and investigators for daily work affords excellent accommodations. It is provided with tables, dark room, aquaria, water, and gas. Microscopes and other apparatus, and a carefully selected list of books are supplied from the University.

Boats, collecting apparatus, dredges, seines, etc., are furnished, and special attention will be given to the methods of collecting and field work.

Professor Moseley's collection in the Sandusky High School, which is particularly rich in the birds of the region, and the Carnegie Library in Sandusky have been very generously opened to laboratory workers.

FEES

The total Laboratory fee is fixed at $20 for a term of six weeks' instruction. No enrolment will be made for less than half a term. Each course is expected to occupy half of the time available, unless it is elected to give the entire time to one subject; therefore each student, on payment of one fee, will be entitled to any two of the courses outlined under the courses of study, and the courses are so arranged that almost any two named may be taken without conflict of hours.

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DATE OF OPENING

The course of instruction will open June 17th and close July 26th, the Laboratory being open longer to students desiring to obtain additional credit.

Five days each week will be devoted to regular exercises and one day left open for individual or special collecting trips.

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TRANSPORTATION AND COMMUNICATION

The various railways, the interurban lines and the steamer service available from Cleveland, Toledo and Detroit afford exceptionally good facilities for reaching the Laboratory with a minimum of time and expense.

Railroads of the Central Passenger Association sell season excursion tickets to Cedar Point, and week end or bi-weekly excursions from many points within a radius of 200 miles of Sandusky afford very cheap rates. For information as to such rates, consult local railroad agents.

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ENTOMOLOGICAL LABORATORY

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Tabanidæ of Ohio. James S. Hine, O. Ac. Sci., S. P. 5, 1-57, 2 pl.

Observation on Hymenopterous Parasites of Certain Fulgoridæ. Otto H. Swezey, O. Nat., III, 444-452.

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On the Place of Origin and Method of Distribution of Taste Buds in Ameiurus Melas. F. L. Landacre, Jour. Comp. Neur. and Psychol. XVII, 1-66.

The Birds of Cedar Point, Sandusky, Ohio. R. L. Baird, O. Nat., Vol. II, p. 143.

Notes on Bird Life of Cedar Point. R. F. Griggs, O. Nat., Vol. I, p. 91.

Dragon Flies of Sandusky. James S. Hine, O. Nat., Vol. I, p. 94.

Sponges and Bryozoans of Sandusky. F. L. Landacre, O. Nat., Vol, I, p. 96.

Zoological Notes. Herbert Osborn, O. Nat., Vol. I, p.86.

Notes on the Flora of Sandusky. W. A. Kellerman, O. Nat., Vol. I, p. 82.

Variations in the Water Snake. Max Morse, O. Nat., Vol. II, p. 183.

Algæ from Sandusky Bay. Lumina C. Riddle, O. Nat., Vol. III, p. 317.

The Flora of Little Chicken Island. John H. Schaffner, O. Nat., Vol. III, p. 331.

Life History Notes on Two Fulgoridæ. Otto H. Swezey, O. Nat., Vol. III, p. 354.

Notes on Interesting Ohio Willows. R. F. Griggs, O. Nat., Vol. IV, p. 11.

New Species of Ohio Fulgoridæ. Herbert Osborn, O. Nat., Vol. IV, p. 44.

A Further Contribution to the Hemipterous Fauna of Ohio. Herbert Osborn, O. Nat., Vol. IV, p. 99.

The Breeding Habits of the Myriopod, Fontaria Indianæ. Max Morse, O. Nat., Vol. IV, p. 161.

The Embryo Sack and Embryo of the Nelumbo. H. H. York, O. Nat., Vol. IV, p. 167.

Flora of Cedar Point. W. A. Kellerman and O. E. Jennings. O. Nat., Vol. IV, p. 186.

Flora of Hen and Chicken Islands, 1903. W. A. Kellerman, O. Nat., Vol. IV, p. 190.

Report of Progress on study of Hemiptera of Ohio and Description of New Species. Herbert Osborn, O. Nat., Vol V, p. 273.

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The Rate of Growth in Epistylis Flavicans. F. L. Landacre, O. Nat., Vol. V, 325.

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The Pinkus Nerve in Amia and Lepidosteus. Chas. Brookover, Science N. S., Vol. XXVII, p. 473 (1908).

The Olfactory Nerve, the Nervus Terminalis and the Preoptic Sympatehetis System in Amia calva. Chas. Brookover, Jour. Comp. Neurology and Psychology, Vol. XX,

The Olfactory Nerve and the Nervus Terminalis of Ameiurus. Chas. Brookover and Theron S. Jackson. Jour. Comp. Neurology and Psychology, Vol. XXI, p. 237-259 (June 1911).

The Origin of the Cranial Ganglia in Ameiurus. F. L. Landacre, Jour. Comp. Neurology and Psychology. Vol. XX, p. 309 (Sept., 1910).

The Birds of Cedar Point and Vicinity. Lynds Jones, Wilson Bulletin. 1910.

Occurrence of Typhlopsylla octatenus in Ohio. Herbert Osborn, O. Nat., Vol. VIII, p. 289 (March 1908.)

Note on the Habits of Senotania rubriventris Macq. Herbert Osborn, O. Nat., Vol. VII, p. 38. (1906)

The Epibanchial Placodes of Ameiurus. F. L. Landacre, O. Nat., Vol. VIII, 251.

The Origin of the Sensory Components of the Cranial Ganglia. F. L. Landacre. The Anatomical Record, Vol. IV, p. 71 (1910).

ADAPTED FROM MOSLEY'S "SANDUSKY FLORA."

The Ohio State University Bulletin is issued at least twenty times during the year; monthly in July, August, September, and June, and bi-weekly in October, November, December, January, February, March, April, and May.

VOLUME XVII NUMBER 9

The Ohio State University Bulletin

The Lake Laboratory

November, 1912

PUBLISHED BY THE UNIVERSITY AT COLUMBUS

Entered as second-class matter November 17, 1905, at the postoffice at Columbus, Ohio, under Act of Congress, July 16, 1894.

THE OHIO STATE UNIVERSITY

The Ohio State University, located at Columbus, is a part of the public educational system maintained by the State. It comprises seven colleges and a graduate school:

The College of Agriculture,
The College of Arts, Philosophy and Science,
The College of Education,
The College of Engineering,
The College of Law,
The College of Pharmacy,
The College of Veterinary Medicine,
The Graduate School.

The University publishes a bulletin describing the work of each of these colleges. Copies may be obtained by addressing W. E. Mann, University Editor, Columbus, Ohio. Persons desiring information are invited to send for the bulletin of that college in which they are interested.

This bulletin is devoted exclusively to a description of the work offered at the Lake Laboratory.

The Lake Laboratory of the Ohio State University, located on Cedar Point near Sandusky, is designed to provide a meeting ground for teachers and students of biology, to afford opportunity for the investigation of the biology of the lake region, and for giving certain courses of instruction in biologicial subjects.

THE LAKE LABORATORY

Staff of Officers and Instructors for 1913

WILLIAM OXLEY THOMPSON, D. D., LL. D.,
PRESIDENT OF THE UNIVERSITY

HERBERT OSBORN, M. Sc., DIRECTOR . . Entomology
Professor of Zoology and Entomology.

WM. M. BARROWS, B. S., S. M., ...
Aquatic Biology, Experimental Zoology.
Assistant Professor of Zoology and Entomology.

STEPHEN R. WILLIAMS, Ph. D., ...
Comparative Anatomy, Invertebrate Morphology.
Professor of Zoology, Miami University

CHARLES BROOKOVER, B. Ped., Ph. D., ...
Ichthyology, Embryology.
Professor of Zoology, Buchtel College.

EDWARD L. FULLMER, M. Sc., ... Botany
Professor of Natural Science, Baldwin University.

CHARLES G. SHATZER, A. M., ...
Ornithology, General Zoology.
Professor of Biology and Geology, Wittenberg College.

JOHN H. SCHAFFNER, ... Ecology
Professor of Botany, Ohio State University.

THE LABORATORY

General Information

LOCATION

The Laboratory has a beautiful site on Cedar Point, located close to the waters of Lake Erie and Sandusky Bay which teem with animal and plant life. Extensive marshes, the river, native forest, sandy beach, and rocky islands, are all within easy reach and furnish opportunities for study of life under greatly varied conditions. Put-in-Bay with the United States Fish Hatchery, Kelly's Island with its famous glacial grooves, and other points of great natural interest are easily reached by excursions and are visited in collecting or special trips. The extensive fishing industry centering at Sandusky affords special opportunity for study and investigation in Ichthyology.

FACILITES

A well equipped laboratory building, capable of accommodating at least one hundred students and investigators for daily work affords excellent accommodations. It is provided with tables, dark room, aquaria, water and gas. Microscopes and other apparatus, and a carefully selected list of books are supplied from the University.

Boats, collecting apparatus, dredges, seines, etc., are furnished, and special attention will be given to the methods of collecting and field work.

Professor Moseley's collection in the Sandusky High School, which is particularly rich in the birds of the region, and the Carnegie Library in Sandusky have been very generously opened to laboratory workers.

FEES

The total Laboratory fee is fixed at $20 for a term of six weeks' instruction. No enrolment will be made for less than half a term. Each course is expected to occupy half of the time available, unless it is elected to give the entire time to one subject; therefore each student, on payment of one fee, will be entitled to any two of the courses outlined under the courses of study, and the courses are so arranged that almost any two named may be taken without conflict of hours.

LIVING

A limited number of students may be housed in the Laboratory and applications for room will be filed in the order of their receipt. Each student is expected to furnish his own outfit, but no rental is charged for room. Room and board in Sandusky ranges from $3.50 to $4.50 per week. The hotels, cottages, tenting privileges, and lunch rooms of Cedar Point afford a wide choice in manner of living. Mrs Schaffner will be present during the session and will have general oversight of the young women who choose to room in the laboratory building. Those who desire to secure rooms in Sandusky will be assisted if they will send a statement of the kind of accommodations they desire.

DATE OF OPENING

The course of instruction will open June 16th and close July 25th, the laboratory being open longer to students desiring to obtain additional credit.

Five days each week will be devoted to regular exercises and one day left open for individual or special collecting trips.

It is desired that applications be made as early as possible, with statement of kind of work desired.

TRANSPORTATION AND COMMUNICATION

The various railways, the interurban lines and steamer service available from Cleveland, Toledo and Detroit afford exceptionally good facilities for reaching the Laboratory with a minimum of time and expense.

Railroads of the Central Passenger Association sell season excursion tickets to Cedar Point, and week end or bi-weekly excursions from many points within a radius of 200 miles of Sandusky afford very cheap rates. For information as to such rates, consult local railroad agents.

Excursions usually run direct to the docks and connect with Cedar Point steamers. Other trains stop at their respective stations; the Big Four and the Pennsylvania are but a short walk, while the Baltimore and Ohio, Lake Shore, and the Lake Erie and Western are convenient to street cars. The Cedar Point dock is at the foot of Columbus avenue, Sandusky.

Trunks must be transferred by launch from Sandusky to the Laboratory. By leaving checks at the Directors office or handing them to a representative of the Island and Terminal Transfer Co. delay or inconvenience may be avoided. It will also avoid extra expense and trouble if all who expect to arrive on Saturday will notify us in advance and turn in checks for baggage as promptly as possible.

Freight should be addressed to Sandusky (not Cedar Point). Have mail addressed **Lake Laboratory, Cedar Point, Ohio.** Express may be addressed in care of Lake Laboratory, Sandusky. Telephone service, both local and long distance, is available in the Laboratory.

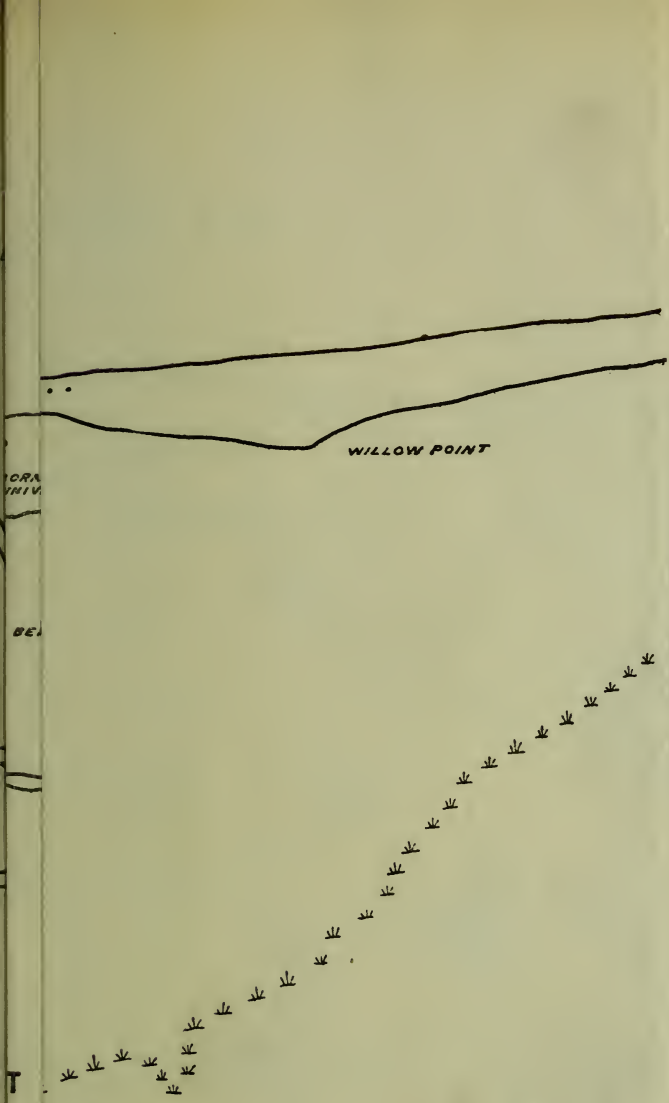
The steamers of the Cedar Point Pleasure Resort Company, which generously granted the site for the Laboratory building, land conveniently near at the Company's dock. The steamers run two or three times every hour during the day and evening, furnishing ready access to Sandusky. Steamers from Cleveland and other points, land at the Eastland dock a mile and a half from the Laboratory.

Application and correspondence relating to the Laboratory should be addressed to the Director.

PROFESSOR HERBERT OSBORN,
Ohio State University,
Columbus, Ohio.

Address after June 15th, Lake Laboratory, Cedar Point, Ohio.

NOTE: The large map of Cedar Point published with this Bulletin will indicate the character of the surroundings and will be of value to students in the location of particular collecting areas. It was prepared by Professors Shatzer and Barrows during the summer of 1912, and is based on the U. S. topographical map with many additions and corrections after careful surveys.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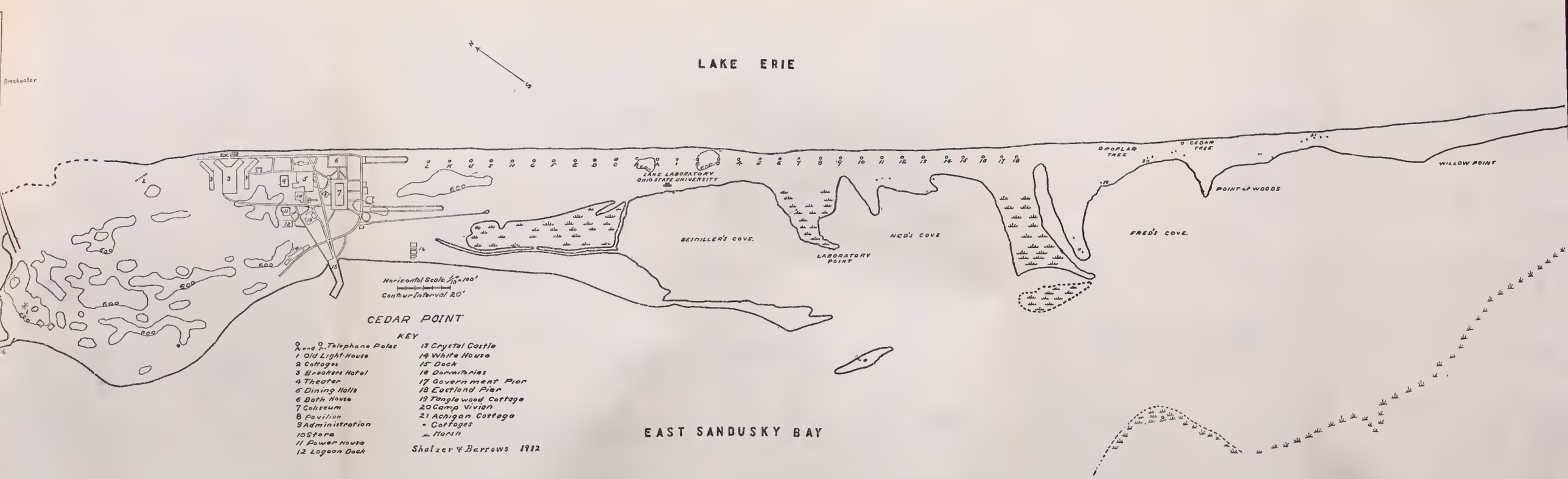
LAKE ERIE
Breakwater
LAKE LABORATORY
OHIO STATE UNIVERSITY
BEIMILLER'S COVE.
LABORATORY
POINT
NED'S COVE
FRED'S COVE.
POPLAR
TREE
CEDAR
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POINT of WOODS
WILLOW POINT
Horizontal Scale 1/10"=100'
Contour Interval 20'
CEDAR POINT
KEY
Along ○ Telephone Poles
1 Old Light House
2 Cottages
3 Breakers Hotel
4 Theater
5 Dining Halls
6 Bath House
7 Coliseum
8 Pavilion
9 Administration
10 Store
11 Power House
12 Lagoon Dock
13 Crystal Castle
14 White House
15 Dock
16 Dormitories
17 Government Pier
18 Eastland Pier
19 Tanglewood Cottage
20 Camp Vivian
21 Achigon Cottage
• Cottages
— North
Shatzer & Barrows 1932
EAST SANDUSKY BAY

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Flora of Hen and Chicken Islands, 1903. W. A. Kellerman, O. Nat., Vol. IV, p. 190.

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The Olfactory Nerve and the Nervus Terminalis of Ameirus. Chas. Brookover and Theron S. Jackson. Jour. Comp. Neurology and Psychology, Vol. XXI, p. 237-259 (June 1911).

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VOLUME XVIII NUMBER 7

The Ohio State University Bulletin

THE LAKE LABORATORY

November, 1913

PUBLISHED BY THE UNIVERSITY AT COLUMBUS

Entered as second-class matter November 17, 1905, at the postoffice at Columbus, Ohio, under Act of Congress, July 16, 1894.

THE OHIO STATE UNIVERSITY

The Ohio State University, located at Columbus, is a part of the public educational system maintained by the State. It comprises seven colleges and a graduate school:

The College of Agriculture,
The College of Arts, Philosophy and Science,
The College of Education,
The College of Engineering,
The College of Law,
The College of Pharmacy,
The College of Veterinary Medicine,
The Graduate School.

The University publishes a bulletin describing the work of each of these colleges. Copies may be obtained by addressing W. E. Mann, University Editor, Columbus, Ohio. Persons desiring information are invited to send for the bulletin of that college in which they are interested.

This bulletin is devoted exclusively to a description of the work offered at the Lake Laboratory.

The Lake Laboratory of the Ohio State University, located on Cedar Point near Sandusky, is designed to provide a meeting ground for teachers and students of biology, to afford opportunity for the investigation of the biology of the lake region, and for giving certain courses of instruction in biologicial subjects.

THE LAKE LABORATORY

Staff of Officers and Instructors for 1914

WILLIAM OXLEY THOMPSON, D. D., LL. D.,
PRESIDENT OF THE UNIVERSITY

*HERBERT OSBORN, M. Sc., DIRECTOR . . . . .
Professor of Zoology and Entomology.

CHARLES BROOKOVER, B. Ped., Ph. D., ...
Acting Director, 1914, Ichthyology, Embryology.
Professor of Histology and Embryology, University of Arkansas.

STEPHEN R. WILLIAMS, Ph. D., ...
Comparative Anatomy, Invertebrate Morphology.
Professor of Zoology, Miami University

EDWARD L. FULLMER, M. Sc., . . . Botany, Ecology
Professor of Biology, Baldwin-Wallace University

CHARLES G. SHATZER, A.M., ...
Ornithology, General Zoology.
Professor of Biology and Geology, Wittenberg College.

W.J. KOSTIR, M. A. . . . . Entomology

*Absent on leave for summer of 1914.

General Information

LOCATION

The Laboratory has a beautiful site on Cedar Point, located close to the waters of Lake Erie and Sandusky Bay which teem with animal and plant life. Extensive marshes, the river, native forest, sandy beach and rocky islands, are all within easy reach and furnish opportunities for study of life under greatly varied conditions. Put-in-Bay with the United States Fish Hatchery, Kelley's Island with its famous glacial grooves, and other points of great natural interest are easily reached by excursions and are visited in collecting or special trips. The extensive fishing industry centering at Sandusky affords special opportunity for study and investigation in Ichthyology.

FACILITIES

A well equipped laboratory building, capable of accommodating at least one hundred students and investigators for daily work affords excellent accommodations. It is provided with tables, dark rooms aquaria, water and gas. Microscopes and other apparatus, and a carefully selected list of books are supplied from the University.

Boats, collecting apparatus, dredges, seines, etc., are furnished, and special attention will be given to the methods of collecting and field work.

Professor Mosely's collection in the Sandusky High School, which is particularly rich in the birds of the region, and the Carnegie Library in Sandusky have been very generously opened to laboratory workers.

FEES

The total Laboratory fee is fixed at $20 for a term of six weeks' instruction. No enrolment will be made for less than half a term. Each course is expected to occupy half of the time available, unless it is elected to give the entire time to one subject; therefore each student, on payment of one fee, will be entitled to any two of the courses outlined under the courses of study, and the courses are so arranged that almost any two named may be taken without conflict of hours.

LIVING

A limited number of students may be housed in the Laboratory and applications for room will be filed in the order of their receipt. Each student is expected to furnish his own outfit, but no rental is charged for room. Room and board in Sandusky ranges from $3.50 to $4.50 per week. The hotels, cottages, tenting privileges, and lunch rooms of Cedar Point afford a wide choice in manner of living. Mrs. Brookover will be present during the session and will have general oversight of the young women who choose to room in the laboratory building. Those who desire to secure rooms in Sandusky will be assisted if they will send a statement of the kind of accommodations they desire.

DATE OF OPENING

The course of instruction will open June 22nd and close July 31st, the laboratory being open longer to students desiring to obtain additional credit.

Five days each week will be devoted to regular exercises and one day left open for individual or special collecting trips.

It is desired that applications be made as early as possible, with statement of kind of work desired.

TRANSPORTATION AND COMMUNICATION

The various railways, the interurban lines and steamer service available from Cleveland, Toledo and Detroit afford exceptionally good facilities for reaching the Laboratory with a minimum of time and expense.

Railroads of the Central Passenger Association sell season excursion tickets to Cedar Point, and the week end or bi-weekly excursions from many points within a radius of 200 miles of Sandusky afford very cheap rates. For information as to such rates, consult local railroad agents.

Excursions usually run direct to the docks and connect with Cedar Point steamers. Other trains stop at their respective stations; the Big Four and the Pennsylvania are but a short walk, while the Baltimore and Ohio, Lake Shore, and the Lake Erie and Western are convenient to street cars. The Cedar Point dock is at the foot of Columbus Avenue, Sandusky.

Trunks must be transferred by launch from Sandusky to the Laboratory. By leaving checks at the Director's office or handing them to a representative of the Island and Terminal Transfer Co., delay or

inconvenience may be avoided. It will also avoid extra expense and trouble if all who expect to arrive on Saturday will notify us in advance and turn in checks for baggage as promptly as possible.

Freight should be addressed to Sandusky (not Cedar Point). Have mail addressed **Lake Laboratory, Cedar Point, Ohio.** Express may be addressed in care of Lake Laboratory, Sandusky. Telephone service, both local and long distance, is available in the Laboratory.

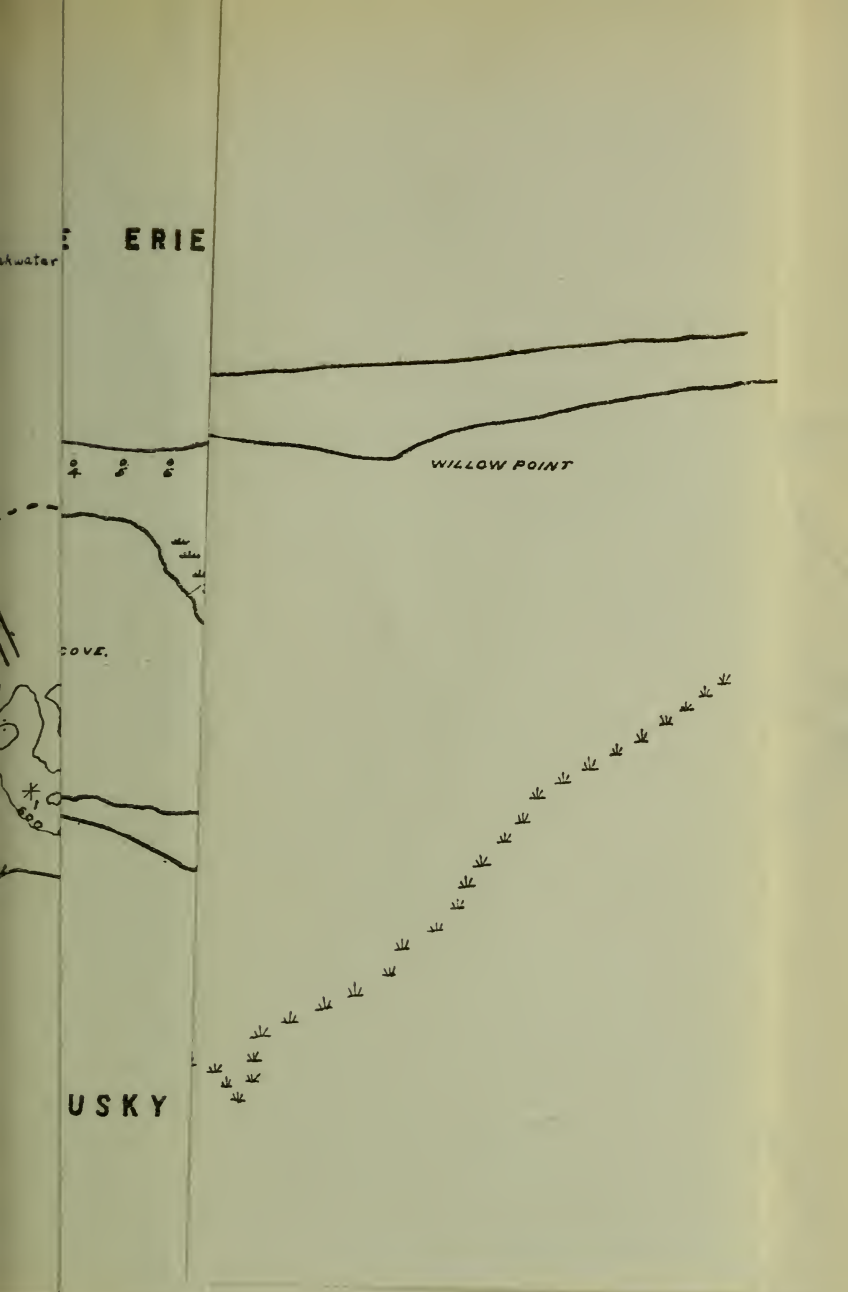
The steamers of the Cedar Point Pleasure Resort Company, which generously granted the site for the Laboratory building, land conveniently near at the Company's dock. The steamers run two or three times every hour during the day and evening, furnishing ready access to Sandusky. Steamers from Cleveland and other points, land at the Eastland dock a mile and a half from the Laboratory.

Application and correspondence relating to the Laboratory should be addressed to the Director.

PROFESSOR HERBERT OSBORN,
Ohio State University,
Columbus, Ohio.

Address after June 22nd, Lake Laboratory, Cedar Point, Ohio.

NOTE: The large map of Cedar Point published with this Bulletin will indicate the character of the surroundings and will be of value to students in the location of particular collecting areas. It was prepared by Professors Shatzer and Barrows during the summer of 1912, and is based on the U, S. topographical map with many additions and corrections after careful survey.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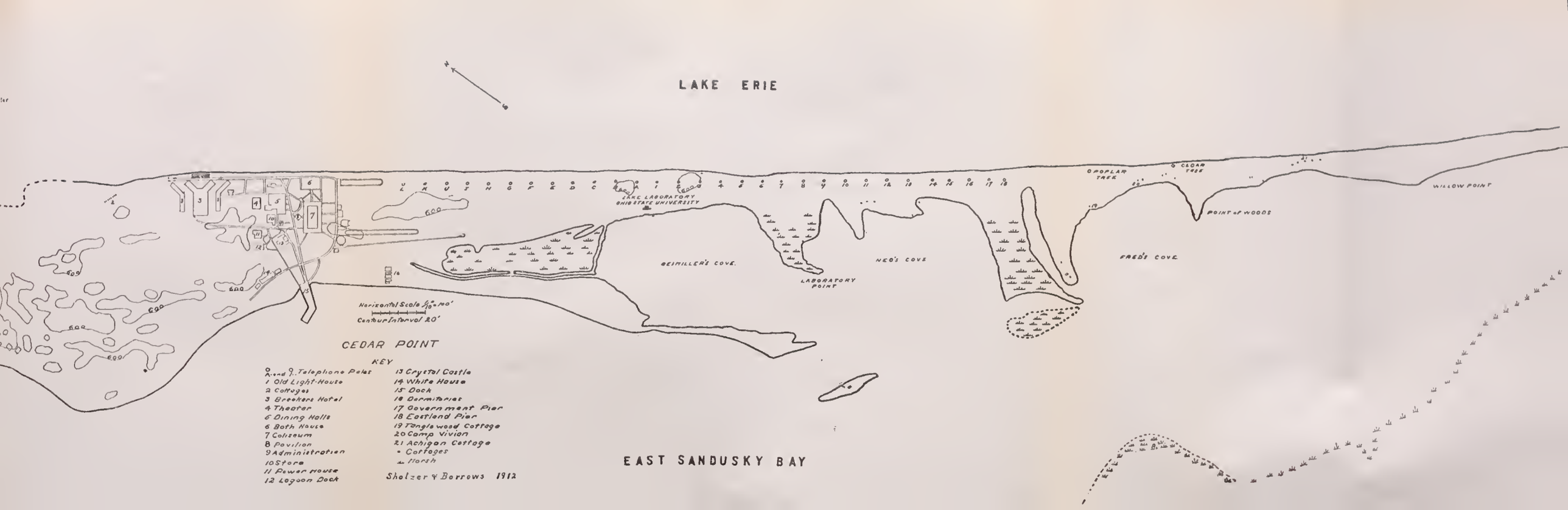
LAKE ERIE
L A K E F R O N T
LAKE LABORATORY
OHIO STATE UNIVERSITY
POPLAR TREE
CEDAR TREE
WILLOW POINT
POINT of WOODS
FRED'S COVE
NEO'S COVE
LABORATORY POINT
GEISMILLER'S COVE
Horizontal Scale 1/10" = 100'
Contour Interval 20'
CEDAR POINT
KEY
Road & Telephone Poles
1 Old Light-House
2 Cottages
3 Breakers Hotel
4 Theater
5 Dining Halls
6 Bath House
7 Coliseum
8 Pavilion
9 Administration
10 Store
11 Power House
12 Lagoon Dock
13 Crystal Castle
14 White House
15 Dock
16 Dormitories
17 Government Pier
18 Eastland Pier
19 Tanglewood Cottage
20 Camp Vivian
21 Achigan Cottage
• Cottages
North
Sholzer & Borrows 1912
EAST SANDUSKY BAY

Courses of Study

ZOOLOGY AND ENTOMOLOGY

* *a* GENERAL ZOOLOGY. Especially for teachers. Laboratory and field courses with occasional lecture and quiz, and including dissection or microscopic study of type forms, aquaria and field studies with instruction in collecting and preparing material for laboratory use and permanent collections.

b. EMBRYOLOGY. A study of mitosis, segmentation, and germ layer formations of different types, but with special emphasis on the development of the fish. The course will be offered as far as possible from material collected at the Laboratory. Students properly quali fied may undertake the study of some embryological problem. Professor Brookover.

ENTOMOLOGICAL LABORATORY

c. ENTOMOLOGY. Field and laboratory course, including instruction in collecting, mounting, and identifying insects in connection with studies in life history and anatomy. Excellent opportunites for life history studies are offered both on aquatic and terrestrial forms, Mr Kostir.

*Not offered in 1914,

d. Ichthyology. Special course devoted particularly to lake fishes, their habits and food supplies. Professor Brookover.

e. Ornithology. Field work, together with lectures on morphology and natural history of birds. In the field work especial attention will be devoted to the study of the shore, swamp, and water birds, breeding habits, and the ecological conditions of the vicinity of the Laboratory. *Each student should be provided with field glass or opera glass.* Professor Shatzer.

f. Invertebrate Morphology. An advanced course including laboratory work on representative forms, investigations of special morphological problems, and a discussion of the classification and phylogenic relationship of the various groups of invertebrates, with occasional lectures and quizzes. This course will be given with special reference to needs of teachers who may wish to extend their acquaintance with invertebrates. Professor Williams.

**g.* Experimental Zoology. Lecture and laboratory course. A review of the methods and results of the experimental study of zoology and evolution, with special reference to later work on variation and heredity. A study of Mendel's law will be undertaken with its application to animal breeding from both the practical and theoretical viewpoint. The laboratory work will consist in the experimental study of certain animals of the region with relation to their variation, environment, breeding habits and growth, including a study of the tropisms. Open to those who have had a course in general zoology.

**h.* Vertebrate Comparative Anatomy. Lectures and laboratory work. In view of the shortness of the term, a rather small number of types will be dissected in the laboratory, and the attention will be concentrated on certain selected organs and systems of organs. The work may be varied to suit individual requirements.

i. Research Work. Students who desire, if properly qualified, may enter upon some faunal, ecological, or other problem, under the direction of some one of the professors present.

j. Aquatic Biology. This course will deal primarily with the fresh water forms of life occurring in Sandusky Bay, paying particular attention to the micro organisms constituting the plankton. After obtaining a general knowledge of the representatives of the various classes of organisms, each student will select one form and study it as exhaustively as time permits. Plankton and Plankton methods will receive due consideration. Throughout the course attention will be paid to the technique of collecting and preparing material. Occasional lectures and quizzes. Professor Williams.

*Not offered in 1914.

BOTANY

*a. General Botany. Especially for teachers. A course in morphology and biology of plants including a study, in natural surroundings so far as possible, of type forms from the lowest to the highest orders. The course will consist of collecting trips in the field where common species of each class are found, and a study in the Laboratory of those features of structure and reproduction which are of interest in connection with the evolution and relationship of each group. Attention is given to methods of preparation and preservation for future use.

b. Ecology. Field and laboratory course, accompanied by lectures, quiz, and consultation of the literature. A study of the struggle for existence among plants, as shown by their reactions and adaptations to the various factors of their environment—water, light, soil, temperature, etc. The identification of trees, shrubs, and herbaceous plants, and their grouping into societies, form a part of the work. Special attention is given to the peculiar conditions in evidence at Cedar Point and vicinity. Professor Fullmer.

BOTANICAL LABORATORY

c. Special Work. Subject selected may be Ecology, Morphology, Systematic Botany, or special work on Algæ or some other group of plants. Professor Fullmer.

*Not offered in 1911.

UNIVERSITY CREDIT

It will noticed that several of the advanced courses cover the ground of university courses. Students with university standing may secure credit for such work. The opportunities for research or thesis work are also exceptionally good in certain lines. Credit at the University will be given on the following basis: One lecture each day and four hour's laboratory work, including the work laid out for Saturday, will give a student credit for six semester hours. When arrangements are made for continuing the work for two additional weeks, nine semester hours credit can be secured.

CREDIT AT OTHER INSTITUTIONS

Credits for work at the Laboratory are accepted for college credit at a number of different institutions. Among those in Ohio which have given or have agreed to give such credits are Kenyon, Dennison, Oberlin, Ohio Wesleyan, Baldwin, Butchel, Miami, and Cincinnati. Others will no doubt agree to such acceptance on application from students.

METHODS

Work will consist very largely of field observations, collections, and study of relation of organisms to environment, supplemented by laboratory dissections and microscopic examinations. The general courses especially, are intended for the benefit of teachers who may wish to familiarize themselves with methods of field work and the manipulation of laboratory material. Special emphasis in all courses will be laid upon the importance of knowing the whole life of the organism.

EXCURSIONS AND COLLECTING TRIPS

From the nature of the locality a great number of delightful excursions are possible, and many rich collecting grounds are visited on these excursions. Special excursions are made on Saturdays. Black Channel, Lakeside, Blue Hole at Castalia, Kelley's Island, Hen and Chicken Islands, Johnson's Island, Put-in-Bay, Green Island, the upper Sandusky Bay and River, gypsum beds near Gypsum, and the Life Saving Stations at Marblehead are among the points usually visited.

GENERAL LECTURES

... Lectures of a general character are given by members of the station staff, and other lectures are secured from outside when possible. These lectures are given weekly or oftener and on topics of general interest. Each member of the instructional force gives at least one lecture.

NATURE STUDY

While no separate courses are given under this title, the work presented in all the courses is based on direct contact with nature and furnishes the fundamental training and experience essential to the proper handling of such work. Teachers in secondary or grade schools having this work in hand or in prospect, will find these courses admirably adapted to help them.

RECREATION

In addition to the field work, collecting excursions, and outdoor activities connected with the regular work, the opportunities for rowing, sailing, and bathing, provide abundant means for physical exercise. The best of health has been the rule with those in attendance, during past years.

FREE TABLES FOR INVESTIGATORS

The Laboratory will be open, as heretofore, to properly qualified persons who may desire to engage in independent investigations of bilogical problems. No fees will be charged, and table room, boats, aquaria, etc., will be supplied, subject only to such provisions as may be necessary to make the facilities equally available to all. Each investigator will be expected to furnish his own microscope, cutting instruments, and special apparatus or reagents needed in his investigation unless otherwise arranged.

It is presumed that all persons taking advantage of this provision are fully prepared to do independent work and, while suggestions and conferences may be freely granted, no claim upon the time of instructors is assumed.

The Laboratory will be open for investigators from June 22nd to September 1st. Applications for table room should be made as early as practicable, with indications of the time during which space will be desired.

Workers who may wish to use the Laboratory for short periods to obtain material in any study will be cordially welcomed and given every facility possible, but must not expect instructors to break in upon regular duties to assist them.

PUBLICATIONS AND RECORDS

A considerable number of publications based wholly or in part on investigations at the Laboratory have been issued and a number of others are in preparation. These are expected in time to cover as fully as possible a systematic record of the plants and animals, occurring in the vicinity of the Laboratory as well as results of morphological, embryological or ecological studies. A partial list is given below. A constantly growing card catalogue record of species occurring at Cedar Point serves to show the available material and forms a basis for faunistic and ecologic studies.

PUBLICATIONS BASED WHOLLY OR IN PART UPON WORK DONE AT THE LAKE LABORATORY

Rotifera of Sandusky Bay. D. S. Kellicott. Trans. Am. Mic. Soc.

The Odonata of Ohio. D. S. Kellicott, O. Ac. Sci., S. P. 2, 1-116, 4 pl.

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A List of the Fungi of Cedar Point. Chas. K. Brain, O. Nat. Vol. XIII, December, 1912.

Additions Made to the Cedar Point Flora During the Summer of 1911 E. L. Fullmer, O. Nat. Vol. XII, February, 1912.

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A Preliminary List of the Acarina of Cedar Point. C. K. Brain, Vol. XIII, April, 1913.

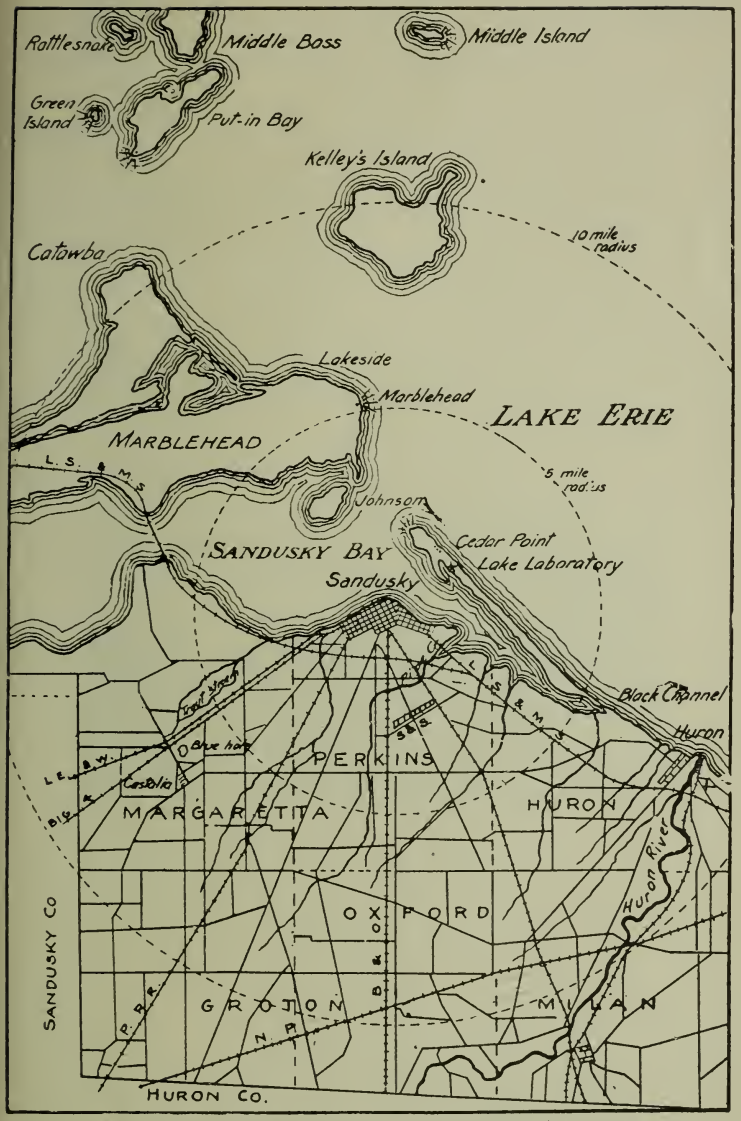
A Preliminary List of the Myxomycetes of Cedar Point. E. L. Fullmer, O. Nat. Vol. XII, Februury, 1912.

Some Entomophilous Flowers of Cedar Point. A. C. Conger, O. Nat. Vol. XII, April, 1912.

The Stratiomyidae of Cedar Point. B. B. Fulton, O. Nat. Vol. XI, March, 1911.

Pollination Notes from the Cedar Point Region. Wm. Bembower, O. Nat. Vol. XI, June 1911.

Additions Made to the Flora of Cedar Point. Stickney, Schaffner, and Davies, O. Nat. Vol. X, January, 1910.



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THE OHIO STATE UNIVERSITY

The Ohio State University, located at Columbus, is a part of the public educational system maintained by the State. It comprises ten colleges and a graduate school:

The College of Agriculture,
The College of Arts, Philosophy and Science,
The College of Dentistry,
The College of Education,
The College of Engineering,
The College of Homeopathic Medicine,
The College of Law,
The College of Medicine,
The College of Pharmacy,
The College of Veterinary Medicine,
The Graduate School.

The University publishes a bulletin describing the work of each of these colleges. Copies may be obtained by addressing L. E. Wolfe, Secretary of the Entrance Board, Columbus, Ohio. Persons desiring information are invited to send for the bulletin of that college in which they are interested.

This bulletin is devoted exclusively to a description of the work offered at the Lake Laboratory.

The Lake Laboratory of the Ohio State University, located on Cedar Point near Sandusky, is designed to provide a meeting ground for teachers and students of biology, to afford opportunity for the investigation of the biology of the lake region, and for giving certain courses of instruction in biological subjects.

THE LAKE LABORATORY

Staff of Officers and Instructors for 1915

WILLIAM OXLEY THOMPSON, D. D., LL. D.,
PRESIDENT OF THE UNIVERSITY

HERBERT OSBORN, M. Sc., DIRECTOR. . . Entomology
Professor of Zoology and Entomology

FREDERICK H. KRECKER, Ph. D., ...
Aquatic Zoology, Comparative Anatomy
Assistant Professor of Zoology and Entomology

STEPHEN R. WILLIAMS, Ph. D., ...
Embryology, Invertebrate Morphology
Professor of Zoology, Miami University

EDWARD L. FULLMER . . . . . Botany, Ecology
Professor of Biology, Baldwin-Wallace College

CHARLES G. SHATZER, A. M., . . Ornithology, Zoology
Professor of Biology and Geology, Wittenberg College

General Information

LOCATION

The Laboratory has a beautiful site on Cedar Point, located close to the waters of Lake Erie and Sandusky Bay which teem with animal and plant life. Extensive marshes, the river, native forest, sandy beaches and rocky islands, are all within easy reach and furnish opportunities for study of life under greatly varied conditions. Put-in-Bay with the United States Fish Hatchery, Kelley's Island with its famous glacial grooves, and other points of great natural interest are easily reached by excursions and are visited in collecting or special trips. The extensive fishing industry centering at Sandusky affords special opportunity for study and investigation in Ichthyology.

FACILITIES

A well-equipped laboratory building, capable of accommodating at least one hundred students and investigators for daily work affords excellent accommodations. It is provided with tables, dark rooms aquaria, water and gas. Microscopes and other apparatus, and a carefully selected list of books are supplied from the University.

Boats, collecting apparatus, dredges, seines, etc., are furnished, and special attention will be given to the methods of collecting and field work.

FEES

The total Laboratory fee is fixed at $20 for a term of six weeks' instruction. No enrolment will be made for less than half a term. Each course is expected to occupy half of the time available, unless it is elected to give the entire time to one subject; therefore each student, on payment of one fee, will be entitled to any two of the courses outlined under the courses of study, and the courses are so arranged that almost any two named may be taken without conflict of hours.

LIVING

A limited number of students may be housed in the Laboratory and applications for rooms will be filed in the order of their receipt. Each student is expected to furnish his own outfit, but no rental is charged for rooms. Room and board in Sandusky ranges from $3.50 to $4.50 per week. The hotels, cottages, tenting privileges, and lunch rooms of Cedar Point afford a wide choice in manner of living. Those who desire to secure rooms in Sandusky will be assisted if they will send a statement of the kind of accommodations they desire.

DATE OF OPENING

The course of instruction will open June 21, and close July 30. The Laboratory be will open longer to students who desire to obtain additional credit.

Five days each week will be devoted to regular exercises and one day left open for individual or special collecting trips.

It is desired that applications be made as early as possible, with statement of kind of work desired.

TRANSPORTATION AND COMMUNICATION

The various railways, the interurban lines and steamer service available from Cleveland, Toledo and Detroit afford exceptionally good facilties for reaching the Laboratory with a minimum of time and expense.

Railroads of the Central Passenger Association sell season excursion tickets to Cedar Point, and the week-end or bi-weekly excursions from many points within a radius of 200 miles of Sandusky afford very cheap rates. For information as to such rates, consult local railroad agents.

Excursions usually run direct to the docks and connect with Cedar Point steamers. Other trains stop at their respective stations; the Big Four and the Pennsylvania are but a short walk, while the Baltimore and Ohio, Lake Shore, and the Lake Erie and Western are convenient to street cars. The Cedar Point dock is at the foot of Columbus Avenue, Sandusky.

Trunks must be tranferred by launch from Sandusky to the Laboratory. By leaving checks at the Director's office or handing them to a representative of the Island and Terminal Transfer Co., delay or inconvenience may be avoided. It will also avoid extra expense and trouble if all who expect to arrive on Saturday will notify us in advance and turn in checks for baggage as promptly as possible.

Freight should be addressed to Sandusky (not Cedar Point). Have mail addressed **Lake Laboratory, Cedar Point, Ohio.** Express may be addressed in care of Lake Laboratory, Sandusky. Telephone service, both local and long distance, is available in the Laboratory.

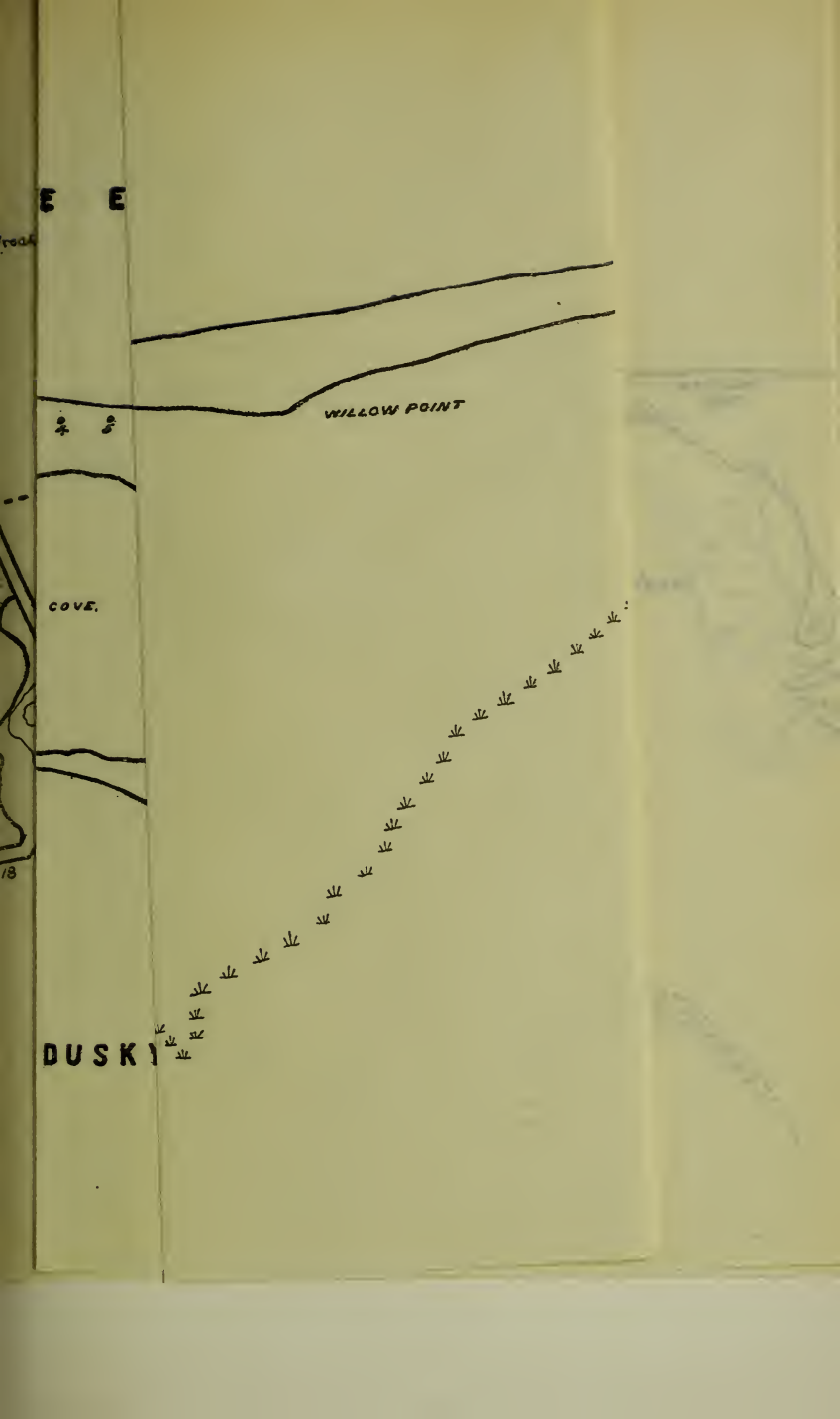
The steamers of the Cedar Point Pleasure Resort Company, which generously granted the site for the Laboratory building, land conveniently near at the Company's dock. The steamers run two or three times every hour during the day and evening, furnishing ready access to Sandusky. Steamers from Cleveland and other points, land at the Eastland dock a mile and a half from the Laboratory.

Application and correspondence relating to the Laboratory should be addressed to the Director.

PROFESSOR HERBERT OSBORN,
Ohio State University,
Columbus, Ohio.

Address after June 21, Lake Laboratory, Cedar Point, Ohio.

Note—The large map of Cedar Point published with this Bulletin will indicate the character of the surroundings and will be of value to students in the location of particular collecting areas. It was prepared by Professors Shatzer and Barrows during the Summer of 1912 and is based on the U. S. topographical map with many additions and corrections after careful survey.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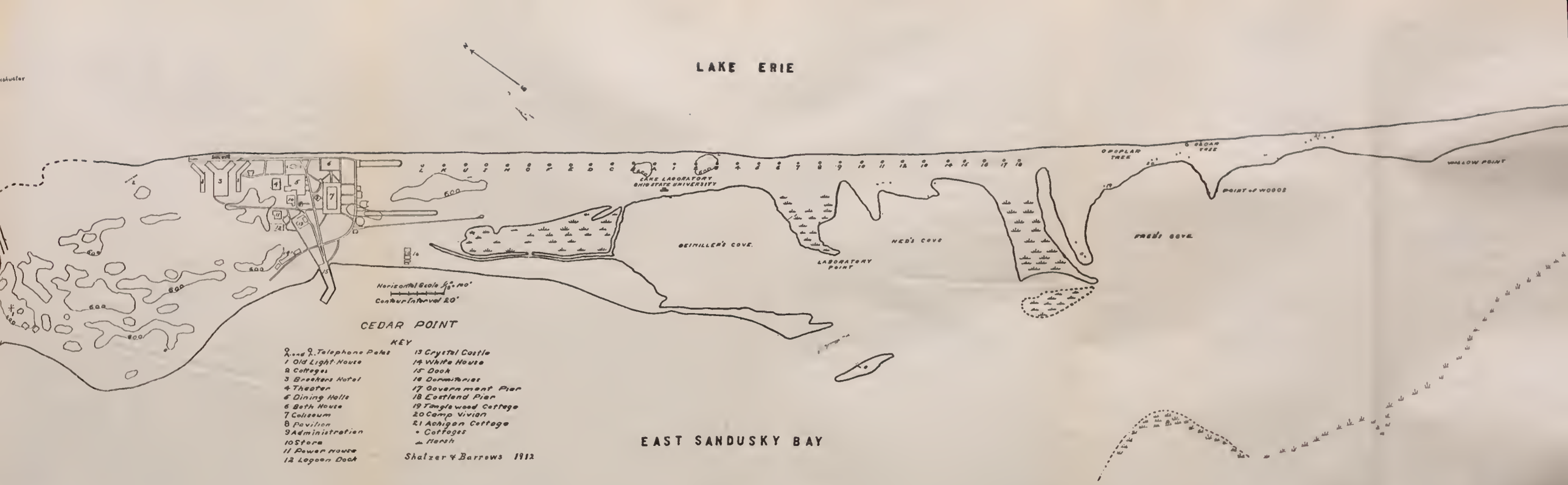
DUSKY


LAKE ERIE
LAKE LABORATORY
OHIO STATE UNIVERSITY
SCHILLER'S COVE
LABORATORY POINT
NED'S COVE
POPLAR TREE
BROAD TREE
POINT OF WOODS
WILLOW POINT
Horizontal Scale 1/8" = 40'
Contour Interval 20'
CEDAR POINT
KEY
1 Old Light House
2 Cottages
3 Breakers Hotel
4 Theater
5 Dining Halls
6 Bath House
7 Coliseum
8 Pavilion
9 Administration
10 Store
11 Power House
12 Lagoon Dock
13 Crystal Castle
14 White House
15 Dock
16 Dormitories
17 Government Pier
18 Eastland Pier
19 Tanglewood Cottage
20 Camp Vivian
21 Achigan Cottage
• Cottages
Marsh
Shalzer & Barrows 1912
EAST SANDUSKY BAY

Courses of Study

ZOOLOGY AND ENTOMOLOGY

*101-2. GENERAL ZOOLOGY. Three to six credit hours. Laboratory and field courses with occasional lecture and quiz, and including dissection or microscopic study of type forms, aquaria and field studies with instruction in collecting and preparing material for laboratory use and permanent collections.

107-8. ENTOMOLOGY. Three to six credit hours. Field and laboratory course, including instruction in collecting, mounting, and identifying insects in connection with studies in life history and anatomy. Excellent opportunites for life history studies are offered both on aquatic and terrestrial forms. Mr. Osborn.

Etomological Laboratory

163. EMBRYOLOGY. Three credit hours. A study of mitosis, segmentation, and germ layer formations of different types, but with special emphasis on the development of the fish. The course will be offered as far as possible from material collected at the Laboratory. Students properly qualified may undertake the study of some embryological problem. Mr. Williams.

*Not offered in 1915.

165. Ichthyology. Three credit hours. Special course devoted particularly to lake fishes, their habits and food supplies. Mr. Shatzer.

167. Vertebrate Comparative Anatony. Three to six credit hours, lectures and laboratory work. In view of the shortness of the term, a rather small number of types will be dissected in the laboratory, and the attention will be concentrated on certain selected organs and systems of organs. The work may be varied to suit individual requirements. Mr. Krecker.

Advanced Undergraduates and Graduates

137-8. Advanced Entomology. Three to eight credit hours. Prerequisite Zoology 101-2, 107-8, or equivalent.

161. Aquatic Zoology. Three to six credit hours. Prerequisite Zoology, 101-2, 121-2 or equivalent. This course will deal primarily with the fresh water forms of life occurring in Sandusky Bay, paying particular attention to the micro organisms constituting the plankton. After obtaining a general knowledge of the representatives of the various classes of organisms, each student will select one form and study it as exhaustively as time permits. Plankton and Plankton methods will receive due consideration. Throughout the course attention will be paid to the technique of collecting and preparing material. Occasional lectures and quizzes. Professor Krecker.

*164. Quantitative Studies in Variation, Heredity and Animal Behavior. 3 to 6 credit hours. Prerequisite Zoology, 101-2, 121-2 or equivalent. Lecture and laboratory course. A review of the methods and results of the experimental study of zoology and evolution, with special reference to later work on variation and heredity. A study of Mendel's law will be undertaken with its application to animal breeding from both the practical and theoretical viewpoint. The laboratory work will consist in the experimental study of certain animals of the region with relation to their variation, environment, breeding habits and growth, including a study of the tropisms.

166. Ornithology. Three to six credit hours. Prerequisite Zoology, 101-2 and an additional year of Biological work. Field work, together with lectures on morphology and natural history of birds. In the field work especial attention will be devoted to the study of the shore, swamp, and water birds, breeding habits, and the ecological conditions of the vicinity of the Laboratory. *Each student should be provided with field glass or opera glass.* Professor Shatzer.

169. Invertebrate Zoology. Three to six credit hours. Prerequisite Zoology, 101-2 and one year additional Zoological work. An ad-

*Not offered in 1915

vanced course including laboratory work on representative forms, investigations of special morphological problems, and a discussion of the classification and phylogenic relationship of the various groups of invertebrates, with occasional lectures and quizzes. This course will be given with special reference to needs of teachers who may wish to extend their acquaintance with invertebrates. Professor Williams.

FOR GRADUATES

241-2. RESEARCH WORK. Three to eight credit hours. Prerequisite Zoology, 101-2, 121-2 or equivalent. Graduate students who desire, if properly qualified, may enter upon some faunal, ecological, or other problem. Professor Osborn.

BOTANY

*101. GENERAL BOTANY. Four credit hours. A course in morphology and biology of plants including a study, in natural surroundings so far as possible, of type forms from the lowest to the highest orders. The course will consist of collecting trips in the field where common species of each class are found, and a study in the Laboratory of those features of structure and reproduction which

*Not offered in 1915.

Botanical Laboratory

are of interest in connection with the evolution and relationship of each group. Attention is given to methods of preparation and preservation for future use. This course is designed especially for teachers.

161. Ecology. Three to six credit hours. Prerequisite Botany, 101-2 and one additional year of some biological subject. Field and laboratory course, accompanied by lectures, quiz, and consultation of the literature. A study of the struggle for existence among plants, as shown by their reactions and adaptations to the various factors of their environment—water, light, soil, temperature, etc. The indentification of trees, shrubs, and herbaceous plants, and their grouping into societies, form a part of the work. Special attention is given to the peculiar conditions in evidence at Cedar Point and vicinity. Mr. Fullmer.

165. Special Work. Three to eight credit hours. Prerequisite Botany, 101-2 and one additional year of some biological subject. Subject selected may be Ecology, Morphology, Systematic Botany, or special work on Algæ or some other group of plants. Mr. Fullmer.

UNIVERSITY CREDIT

It will be noticed that several of the advanced courses cover the ground of university courses. Students with university standing may secure credit for such work. The opportunities for research or thesis work are also exceptionally good in certain lines. Credit at the University will be given on the following basis: One lecture each day and four hour's laboratory work, including the work laid out for Saturday, will give a student credit for six semester hours. When arrangments are made for continuing the work for two additional weeks, nine semester hours credit can be secured.

CREDIT AT OTHER INSTITUTIONS

Credits for work at the Laboratory are accepted for college credit at a number of different institutions. Among those in Ohio which have given or have agreed to give such credits are Kenyon, Denison, Oberlin, Ohio Wesleyan, Baldwin, Akron, Miami and Cincinnati. Others will no doubt agree to such acceptance on application from students.

METHODS

Work will consist very largely of field observations, collections, and study of relation of organisms to environment, supplemented by laboratory dissections and microscopic examinations. The general

courses especially, are intended for the benefit of teachers who may wish to familiarize themselves with methods of field work and the manipulation of laboratory material. Special emphasis in all courses will be laid upon the importance of knowing the whole life of the organism.

EXCURSIONS AND COLLECTING TRIPS

From the nature of the locality a great number of delightful excursions are possible, and many rich collecting grounds are visited on these excursions. Special excursions are made on Saturdays. Black Channel, Lakeside, Blue Hole at Castalia, Kelley's Island, Hen and Chicken Islands, Johnson's Island, Put-in-Bay, Green Island, the upper Sandusky Bay and River, gypsum beds near Gypsum, and the Life Saving Stations at Marblehead are among the points usually visited.

GENERAL LECTURES

Lectures of a general character are given by members of the station staff, and other lectures are secured from outside when possible. These lectures are given weekly or oftener and on topics of general interest. Each member of the instructional force gives at least one lecture.

NATURE STUDY

While no separate courses are given under this title, the work presented in all the courses is based on direct contact with nature and furnishes the fundamental training and experience essential to the proper handling of such work. Teachers in secondary or grade schhools aving this work in hand or in prospect, will find these courses admirably adapted to help them.

RECREATION

In addition to the field work, collecting excursions, and outdoor activities connected with the regular work, the opportunities for rowing, sailing, and bathing, provide abundant means for physical exercise. The best of health has been the rule with those in attendance, during past years.

FREE TABLES FOR INVESTIGATORS

The Laboratory will be open, as heretofore, to properly qualified persons who may desire to engage in independent investigation of biological problems. No fees will be charged, and table room, boats,

aquaria, etc., will be supplied, subject only to such provisions as may be necessary to make the facilities equally available to all. Each investigator will be expected to furnish his own microscope, cutting instruments, and special apparatus or reagents needed in his investigation unless otherwise arranged.

It is presumed that all persons taking advantage of this provision are fully prepared to do independent work and, while suggestions and conferences may be freely granted, no claim upon the time of instructors is assumed.

The Laboratory will be open for investigators from June 21 to August 15th. Applications for table room should be made as early as practicable, with indications of the time during which space will be desired.

Workers who may wish to use the Laboratory for short periods to obtain material in any study will be cordially welcomed and given every facility possible, but must not expect instructors to break in upon regular duties to assist them.

PUBLICATIONS AND RECORDS

A considerable number of publications based wholly or in part on investigations at the Laboratory have been issued and a number of others are in preparation. These are expected in time to cover as fully as possible a systematic record of the plants and animals, occurring in the vicinity of the Laboratory as well as results of morphological, embryological or ecological studies. A partial list is given below. A constantly growing card catalogue record of species occurring at Cedar Point serves to show the available material and forms a basis for faunistic and ecologic studies.

PUBLICATIONS BASED WHOLLY OR IN PART UPON WORK DONE AT THE LAKE LABORATORY

Rotifera of Sandusky Bay. D. S. Kellicott, Trans. Am. Mic. Soc.

The Odonato of Ohio. D. S. Kellicott, O. Ac. Sci., S. P. 2, 1-116, 4 pl.

The Fishes of Ohio. Raymond C. Osborn, O. Ac. Sci., S. P. 4, 1-104.

Galls and Insects Producing Them. Melville Thurston Cook, parts 1 to 9, O. Nat., II, 263; III, 419; IV, 125.

Tabanidæ of Ohio. James S. Hine, O. Ac. Sci., S. P. 5, 1-157, 2 pl.

Observation on Hymenopterous Parasites of Certain Fulgoridæ. Otto H. Swezey, O. Nat., III, 444-452.

A List of the Orthoptera of Ohio. C. S. Mead, O. Nat., IV, 109-112.

The Coccidæ of Ohio. James G. Sanders, O. Ac. Sci., S. P. 8, 65 pp., 9 pl., 86 fig.

Batrachians and Reptiles of Ohio. Max Morse, Pr. O. Ac. Sci., IV, 91-144.

An Ecological and Experimental Study of Sarcophagidæ with Relation to Lake Beach Debris. W. B. Herms, Jour. Exp. Zool., IV, 45-83.

On the Place of Origin and Method of Distribution of Taste Buds in Ameiurus Melas. F. L. Landacre, Jour. Comp. Neur. and Psychol., XVII, 1-66.

The Birds of Cedar Point, Sandusky, Ohio. R. L. Baird, O. Nat., Vol. II, p. 143.

Notes on Bird Life of Cedar Point. R. F. Griggs, O. Nat., Vol. I, p. 91.

Dragon Flies of Sandusky. James S. Hine, O. Nat., Vol. I, p. 94.

Sponges and Bryozoans of Sandusky. F. L. Landacre, O. Nat., Vol. I, p. 96.

Zoological Notes. Herbert Osborn, O. Nat., Vol. I. p. 86.

Notes on the Flora of Sandusky. W. A. Kellerman, O. Nat , Vol. I, p. 82.

Variations in the Water Snake. Max Morse, O. Nat., Vol II, p. 183.

Algæ from Sandusky Bay. Lumina C. Riddle, O. Nat., Vol. III, p. 317.

The Flora of Little Chicken Island. John H. Schaffner, O. Nat., Vol. III, p. 33.

Life History Notes on Two Fulgoridæ. Otto H. Swezey, O. Nat., Vol. III, p. 354.

Notes on Interesting Ohio Willows. R. F. Griggs, O. Nat., Vol. IV, p. 11.

New Species of Ohio Fulgoridæ. Herbert Osborn, O. Nat., Vol. IV, p. 44.

A Further Contribution to the Hemipterous Fauna of Ohio. Herbert Osborn, O. Nat., Vol. IV, p 99.

The Breeding Habits of the Myriopod, Fontaria Indianæ. Max Morse, O. Nat., Vol. IV, p. 161.

The Embryo Sack and Embryo of the Nelumbo. H. H. York, O. Nat., Vol. IV, p. 167.

Flora of Cedar Point. W. A. Kellerman and O. E. Jennings. O. Nat., Vol. IV, p. 186.

Flora of Hen and Chicken Islands, 1903. W. A. Kellerman, O. Nat., Vol. IV, p. 190.

Report of Progress on study of Hemiptera of Ohio and Description of New Species. Herbert Osborn, O. Nat., Vol. V, p. 273.

Notes on the Morphology of Philotria. Lumina C. Riddle, O. Nat., Vol. V, p. 304.

The Rate of Growth in Epistylis Flavicans. F. L. Landacre, O. Nat., Vol. V, p. 325.

The Willows of Ohio. R. F. Griggs, Proc. Ohio Acad. Sci., S. P. No. 11.

The Naididæ of Cedar Point. L. B. Walton, Am. Nat., Vol. XL, p. 638.

Notes on the Fall Webb Worm(Hyphantria cunea)in Ohio. E. W. Berger, O. Nat., Vol. VI, p. 453.

Correlation and Variation in Internal and External Characters in the Common Toad (Bufo lentiginosus Americanus Le C.). W. E. Kellicott, Jour. of Exp. Zoology, Vol. IV, 575.

An Ecological Classification of the Vegetation of Cedar Point. Otto E. Jennings, O. Nat., Vol. VIII, 291.

The Protozoa of Sandusky Bay and Vicinity. F. L. Landacre, Ohio Ac. Sci., S. P., 13.

The Pinkus Nerve in Amia and Lepiodosteus. Chas. Brookover, Science N. S., Vol. XXVII, p. 473 (1908)

The Olfactory Nerve, the Nervus Terminalis and the Preoptic Sympathetic System in Amia calva. Chas. Brookover, Jour. Comp. Neurology and Psychology, Vol. XX.

The Olfactory Nerve and the Nervus Terminalis of Ameiurus. Chas. Brookover and Theron S. Jackson, Jour. Comp. Neurology and Psychology, Vol. XXI, p. 237-259 (June, 1911).

The Origin of the Cranial Ganglia in Ameiurus. F. L. Landacre, Jour. Comp. Neurology Psychology. Vol. XX, p. 309 (Sept., 1910).

The Birds of Cedar Point and Vicinity. Lynds Jones, Wilson Bulletin. 1910.

Occurrence of Typhlopsylla octatenus in Ohio, Herbert Osborn, O. Nat., Vol. VIII, p. 289 (March, 1908).

Note on the Habits of Senotania rubriventris Macq. Herbert Osborn O. Nat., Vol. VIII, p. 38 (1906).

The Epibanchial Placodes of Ameiurus. F. L. Landacre, O. Nat., Vol. VIII, 251.

The Origin of the Sensory Components of the Cranial Ganglia. F. L. Landacre. The Anatomical Record, Vol. IV, p. 71 (1910).

Syrphidae of Ohio. C.L. Metcalf. Bulletin I, Ohio Biological Survey, 1913.

A List of the Fungi of Cedar Point. Chas. K. Brain, O. Nat., Vol. XIII, December, 1912.

Additions Made to the Cedar Point Flora During the Summer of 1911. E. L. Fullmer, O. Nat., Vol. XII, February, 1912.

Additions Made to the Cedar Point Flora During the Summer of 1912. E. L. Fullmer, O. Nat., Vol. XIII, December, 1912.

A Preliminary List of the Acarina of Cedar Point. C. K. Brain, Vol. XIII, April, 1913.

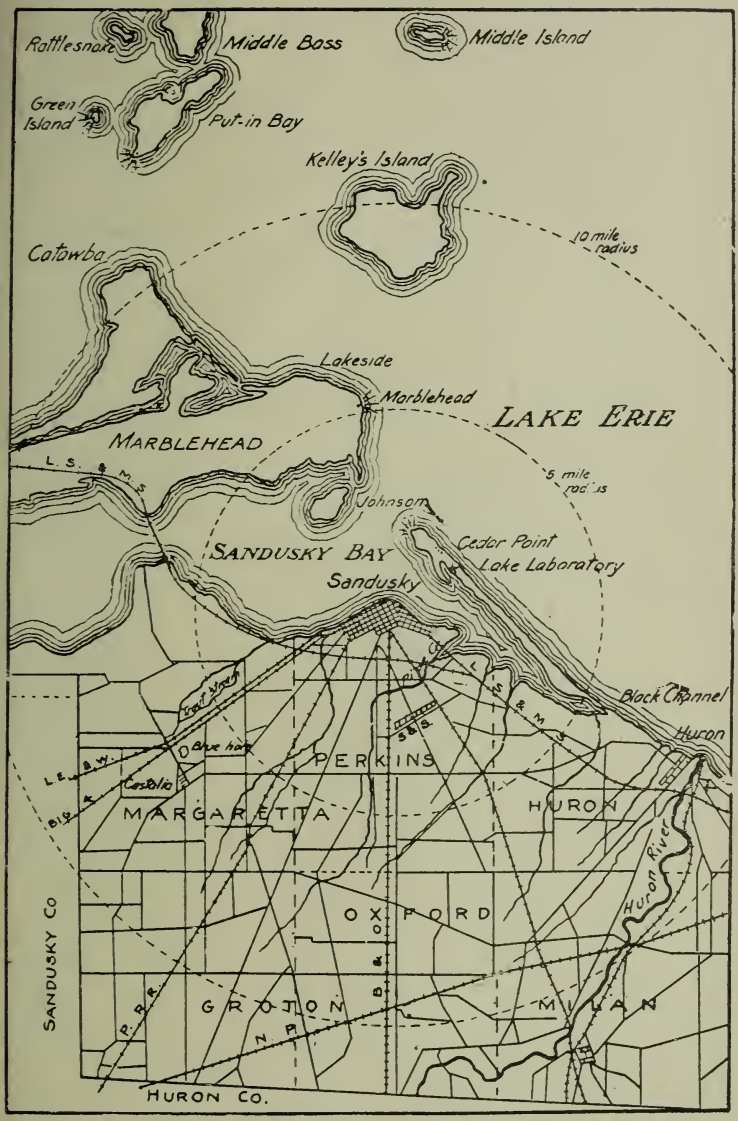
A Preliminary List of the Myxomycetes of Cedar Point. E. L. Fullmer, O. Nat., Vol. XII, February, 1912.

Some Entomophilous Flowers of Cedar Point. A. C. Conger, O. Nat., Vol. XII, April 1912.

The Stratiomyidæ of Cedar Point. B. B. Fulton, O. Nat., Vol. XI, March, 1911.

Pollination Notes from the Cedar Point Region. Wm. Bembower, O. Nat., Vol. XI, June 1911.

Additions Made to the Flora of Cedar Point. Stickney, Schaffner, and Davies, O. Nat., Vol. X, January 1910.



ADAPTED FROM MOSLEY'S "SANDUSKY FLORA."

The Ohio State University Bulletin is issued at least twenty times during the year, monthly in July, August, September, and June, and bi-weekly in October, November, December, January, February, March, April, and May.

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